IVR-100G

Test Module Manual

Product images are for illustrative purposes only and may differ from the actual product.

IVR-100G test module is particularly designed for network test engineer to do deployment and comprehensive test for Ethernet and OTN. This module satisfies the current increasingly test demand of Core Network and MAN 100GE and OTU4 such high speed network performance and stability. It fully meets Ethernet standards such as RFC-2544, Y.1564, Multiple Streams, and supports 100 Gigabit Ethernet WAN and LAN network test with high reliability, convenience, and flexibility.

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Revision History

The following tables shows the revision for this document.

Date	Version	Revision
17/11/2016	1.0	Initial Release
18/11/2016	1.10	Module version has been updated Change Figure 6.13: About Change Figure 6.14: System Information Change Figure 6.15: Module Information Change Description and All Figures of Table 7.1: PHY Add Test Threshold in RFC2544 in Table 7.4 RFC2544 Add Bi-directional Test Case in Section 7.1.9: Bi-directional Change Description and All Figures of Table 7.7: Port Add Advance Ping in Section 9.9: Advance Ping Add Advance Loopback in Section 9.10: Advance Loopback

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1. Introduction

1.1 Overview

IVR-100G 100Gigabit Ethernet/OTN test module is one of InterVRE modular test products, and which is particularly designed for network test engineer to do deployment and comprehensive test for Ethernet.

This module is designed for satisfying the current increasingly test demand of Core Network and MAN 100GE and OTU4 such high speed network performance and stability. It fully meets Ethernet standards, and supports 100 Gigabit Ethernet WAN and LAN network test with high reliability, convenience, and flexibility.

1.2 Main Features

IVR-100G 100Gigabit Ethernet/OTN test module has the following features:

Ethernet:

- PHY and PCS test;
- Throughput, frame loss, latency, back-to-back test as per RFC2544.
- Ethernet BERT test.
- Allow stream-generation according to VLAN ID/priority, Q in Q and TOS/DSCP configuration.
- Feature-rich stream statistics, error analysis and alarm indication.
- MPLS/PWE3
- Protection switching test, and the accurate time test of the business interruption.
- Support ITU-T Y.1564 test. Pass a test can complete verification of all SLA parameters, so as to ensure the QoS to achieve the design goal.
- Layer 1 to layer 4 loopback test.

OTN:

- OTN testing for OTU4;
- Complete multi-stage Mapping/Multiplexing;
- Ethernet over OTN;

- Service Disruption Measurements;
- Overhead monitoring and byte decoding;
- Terminate and Through test modes;
- Per-lane optical power and frequency measurements;
- External clock reference interface;
- Eye diagram reference interface;
- Error Injection and Alarm Generation.

1.3 Compatible Platforms

IVR-100G Ethernet/OTN Test Module is compatible with the following InterVRE test platforms:

- IVR-100p ntelligent network test platform.

2. Description

2.1 Front Panel View

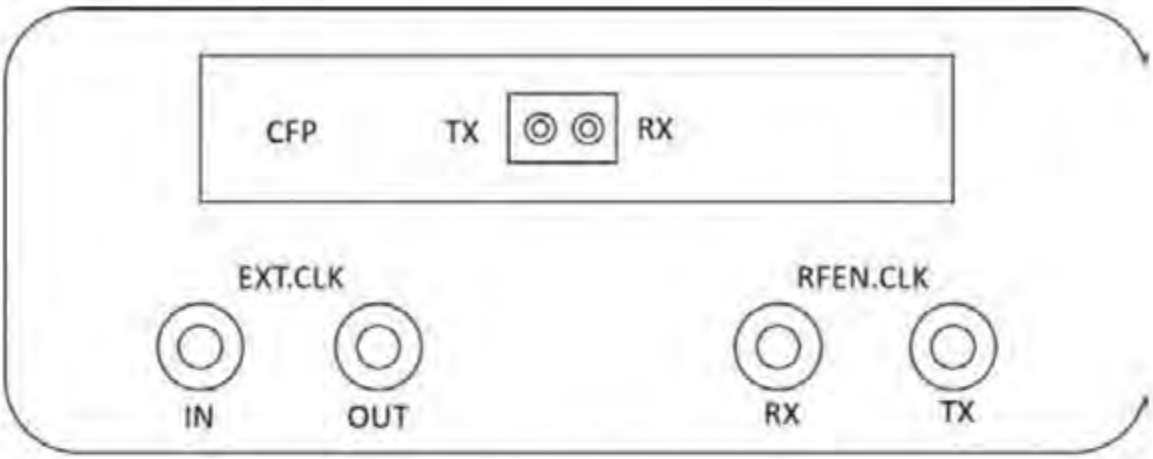


Figure 2.1 IVR-100G 100Gigabit Ethernet/OTN Module Front Panel View

2.2 Interfaces

Table 2.1 describes the interfaces of IVR-100G

Table 2.1 Interfaces Description

Interfaces	Quantity	Description
100G Ethernet/OTN Optical Interface	1	• Signal: 100Gb/s optical signal; • Type: CFP optical port.
External CLK Interface	1	• Signal: External clock signal, support, • DS1/E1, • E1, • 2M Hz; • Type: SMA; • Impedance: 50 ohm.
Reference Output CLK Interface	1	• Signal: Output a reference clock signal for other equipment; • Type: SMA; • Impedance: 50 ohm.

2.3 LED Indicators

Table 2.2 describes the LEDs placed on IVR-100G as indicators.

Table 2.2 LED Indicator Definitions

Interface	LED	Status	Description
100Gigatbit Ethernet	LINK/ACT	Green	Link has been established successfully, but no data frame transmission.
		Green, (Flashing)	Link has been established successfully, data frame is transmitting.
		Off	Link has not been established.
	LASER	Red	Optical signal is transmitting.
		Off	No optical signal transmission.

3. Specifications

3.1 Environmental Guidelines

IVR-100G module can work normally and stably under the severe environmental condition. Table 3.1 defines these environmental conditions which are complied with the IVR-100p platform.

Table 3.1 Environmental Ranges

	Temperature Range	Humidity Range
Operational	-10°C to 50°C	0% to 95%(non-condensing)
Storage	-40°C to 70°C	0% to 95%(non-condensing)

3.2 Other Physical Specifications

IVR-100G module's some other physical specifications are described in Table 3.2.

Table 3.2 Other Physical Specifications

Specification	Description
Power consumption	< 42W
Dimension	Dimension (H×W×D) = 25mm x 97mm x 259mm;
Weight	< 0.4kg

4. Safety Information

4.1 General Safety Information

If the device has not been stored properly under the storage temperature range, the device's temperature must be guaranteed to reach the operational temperature before turn it on *(Specific environmental information can be found in Table 3.1).*

4.2 Laser Safety Information

- Do not install or detach fibres directly when a light source is activated;
- Do not attempt to look directly into the fibre, in case your eyes will be injured by optical signal;
- The device is Class 1M laser product, complies with IEC 60825-1 Amendment: 2001 and 21 CFR 1040.10, hence invisible laser radiation could be emitted from optical fibre output port;
- Safety can be guaranteed by operating the device under a predictable and reasonable conditions, however using an optical instrument to view the laser beam whether is diverged or not is potentially hazardous, therefore do not attempt to use an optical instrument to view the laser beam directly.

4.3 Electrical Safety Information

- Ventilation should be guaranteed around the device;
- Operating the device under the environment with highly inflammable gas will cause a significant safety incident;
- Wiring and other electrical facilities installation under this device working environment must be in compliance with the Building and Electrical Code which is authorised by the local authorities;
- Do not attempt to repair or modify the device without authority, if any service is needed, please contact the InterVRE *(Section12.2: Technical Support Contact).*

5. Installation of the Device

5.1 Turn the Device On or Off

The instruction of turn the device on or off can be found in ***IVR-100p Intelligent Network Test Platform User Guide***.

5.2 Install or Upgrade the Applications

All essential applications have been preinstalled and configured at the factory. Also, extra applications will be installed or existing applications will be required to upgrade, when new test modules have been purchased and installed, or newest version of the application has been purchased. Table 5.1 describes the hardware requirements for applications installing or upgrading.

Table 5.1 Application Installing or Upgrading Hardware Requirements

Name	Quantity
CD for Installation	1
Computer with USB Port	1
IVR-100p Network Test Platform	1
USB Memory Drive or USB Cable	1 or 1

Applications can be installed or upgraded by the following steps:

- Turn on the computer and insert the installation CD into the CD-ROM drive;
- Using USB memory drive or USB cable to transfer the application installation package (normally is the folder named 'Setup') from the local computer to IVR-100p Network Test Platform,

  ***(Specific information for files transfer between the device and USB memory drive or files transfer between the device and the local computer can be seen respectively in** IVR-100p **User Guide)**;*
- Run IVR-100p_TEthernet_V1.0.0.5_SETUP.exe' software;
- Click 'Setup' button.

Figure 5.1 Application Installation

5.3 Insert or Remove the Module into or from IVR-100p

(Note: Do not attempt to insert or remove a module while IVR-100p Network Test Platform is active running. The device and modules will be damaged irreparably and immediately if the module has been detached directly without the device has been shut down completely.)

5.3.1 Insert Test Module

Insert a test module into IVR-100p Network Test Platform needs to follow the steps demonstrates in below:

- Turn off the device completely;
- Put IVR-100p Network Test Platform's front panel upward ***(Figure 5.2 Diagram of Placing IVR-100p Network Test Platform)***;

Figure 5.2 Placing IVR-100p Network Test Platform Front Panel Upward

- Hold and place the module vertically, and make sure the locking screw hole is on the left of the connector pins,

(Note: Connector pins will be broken resulting in permanent damage to the module if the module was inserted in a wrong direction);

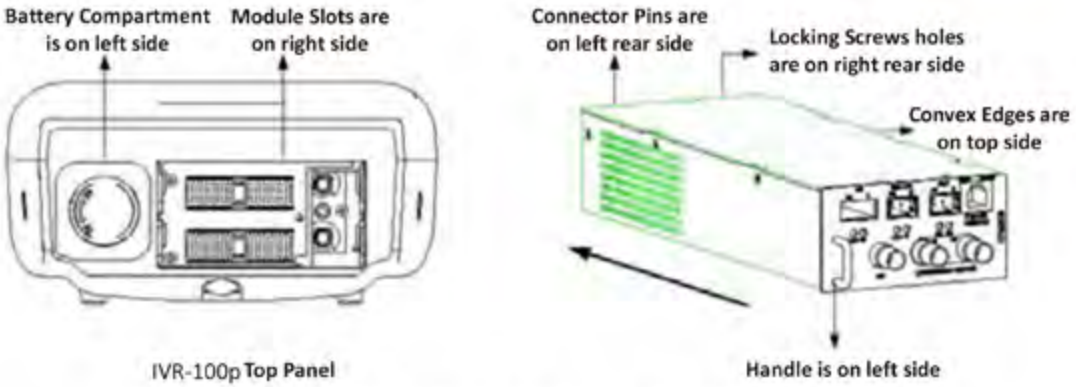


Figure 5.3 Inserting the Module into Device' Slots

- Slowly insert the convex edges of the module into the grooves of IVR-100p'sslot;
- Push the module to the bottom of the slot, until the locking screw hole of the module has been contacted with the bottom locking screw of IVR-100p Network Test Platform;
- Put IVR-100p Network Test Platform bottom panel upward, and find the locking screw of the slot which has been inserted by the module;
- Press on the module slightly, and tighten the locking screw by using screw driver screwing clockwise. The module block must be locked tightly in the slot.

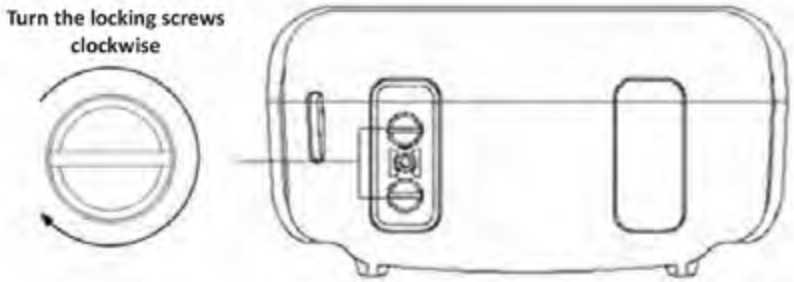


Figure 5.4 Tightening Bottom Panel Screw

The module will be detected automatically, when the device is started up again.

5.3.2 Remove Test Module

Remove a test module from IVR-100p Network Test Platform needs to follow the steps demonstrates in below:

- Turn off the device completely;
- Put IVR-100p Network Test Platform bottom panel upward, and find the locking screw of the slot which has been inserted by the module;

Installation

- Using a screw driver to loosen the locking screw entirely by screwing counter-clockwise, the module block is released from the slot;

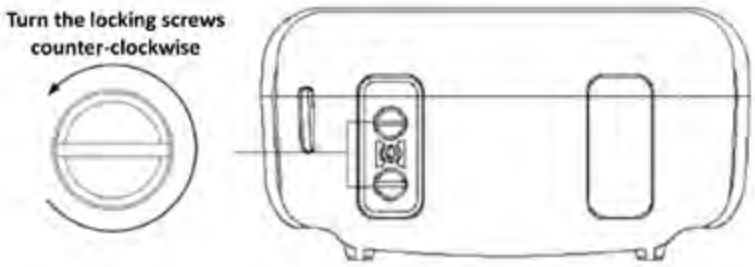


Figure 5.5 Loosening the Bottom Panel Screw

- Put IVR-100p Network Test Platform top panel upward;
- Grab the module by its sides or by the handle and pull it out, ***(Note: Do not grab the module by the connector. Serious damage will be occurred when the module has been pulled out by grabbing connector, please grab the shell of the module to pull it out)***;

Figure 5.6 Pulling the Module out of the Device' Slot

- Cover empty slots by the supplied protective covers.

6. Ethernet/OTN User Interface

6.1 Start Ethernet/OTN Application

Start the Ethernet/OTN application needs to follow the following steps:

- After the module has been installed into the platform properly ***(Section 5.3 Install module into IVR-100p)***, start IVR-100p platform.
- IVR-100G module will be displayed on the platform's main window, then select the module;
- Click right side 'Run' button, or double-click the module to run IVR-100G Module;
- Select '100G Ethernet' or '100G OTN' to enter test application.

Figure 6.1 IVR-100p Start the Ethernet/OTN Application

Figure 6.2 Select Test Application

6.2 Ethernet Main Interface

After IVR-100G Ethernet/OTN Module has been started, and select to enter '100G Ethernet' the main interface of 100G Ethernet test will be displayed on the screen, which is comprised by Main menu; Display window; and Toolbar these 3 parts.

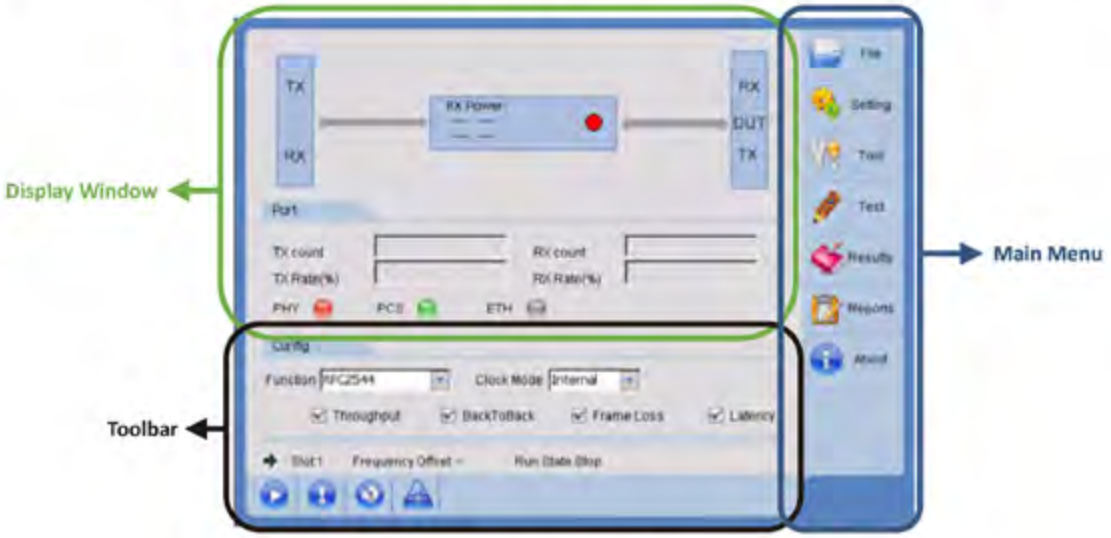


Figure 6.3 Main Interface of 100G Ethernet Application

6.2.1 Ethernet Main Menu

Ethernet Main Menu is on the right side of Display Window, and is comprised by 'Files'; 'Setting'; 'Tool'; 'Test'; 'Result'; 'Report'; 'and 'About' these 7 sub menus. Specific functions of each sub menu are demonstrated in Table 6.1.

Table 6.1 IVR-100G Ethernet Main Menu Functions List

Sub menu	Function	Diagram
File	• New: Create a new test; • Open: Load the test configuration file which has been saved before; • Save: Save the current test configuration; • Exit: Exit the programme and confirmation dialogue box will appear. ***(Note: The 'New' option is ONLY available when the test has been created and has not been run.)***	Figure 6.4 File

Setting	• General Setting:
	  • PHY Config: Set the parameters of PHY;
	  • PCS Config: Set the parameters of PCS;
	  • PHY/PCS Error Insert: Insert PHY/PCS error.
	  • External Clock: Set the parameters of external clock;
	  • Bi-directional Test: Set the parameters of bi-directional test.
	(Note: Bi-directional Test is ONLY available under RFC2544, Frame Analysis, BERT, and Y.1564.)	

<table>
<tr><th>Sub menu</th><th>Function</th><th>Diagram</th></tr>
<tr><td rowspan="5">Setting</td><td>• RFC2544:
• Stream Generation: Set the stream parameters of the selected test items;
• RFC2544 Setup: Set the parameters of RFC2544 test.
(Note: The configuration items will be different under different functions.)</td><td rowspan="5">
Figure 6.5 Setting (RFC2544, Frame Analysis, BERT, and Loop Back)

Figure 6.6 Setting (Y.1564)

Figure 6.7 Setting (User Define)</td></tr>
<tr><td>• Frame Analysis:
• Stream Generation: Set the stream parameters of the selected test items.
(Note: The configuration items will be different under different functions.)</td></tr>
<tr><td>• BERT:
• Stream Generation: Set the stream parameters of the selected test items;
• ETH Error Insertion: Set the parameters of ETH error insertion.
(Note: The configuration items will be different under different functions.)</td></tr>
<tr><td>• Loop Back:
• Frame Loss Test: Discard a part of data of the received packet;
• Loopback/Through Setup: Set the returnable data stream.</td></tr>
<tr><td>• Y.1564:
• Service Setup: Set the service parameters of Y.1564;
• User Define:
• User-defined Packet Setup: Set the parameters of user define packet.</td></tr>
<tr><td>Tool</td><td>• Ping Setup: Set the parameters of Ping test;
• Trace Route: Set the parameters of trace router;
• Flow Control: Control and send data flow;
• FTP: Connect FTP server;
• HTTP: Connect HTTP address to test the connectivity;
• Online Service Scan: Scan the number of data packets online and calculate bandwidth utilisation rate on Rx side;
• Filter: Set the parameter of the filter and check the result;
• Packet Capture: Capture the data package;
• Advanced Loopback: To run advance loopback function;
• Advanced Ping: To run advance ping function.
(Note: Flow Control is ONLY available under Frame Analysis test; and Packet Capture is ONLY available when Frame Analysis is conducting and data steam has been began to send and receive.)</td><td>
Figure 6.8 Tool</td></tr>
</table>

Interface

Sub menu	Function	Diagram

Test	• Start: Start test;
	• Stop: End test;
	• Clear: Clear the test result;
	• Send suspended: Suspend the test;
	• Send recovery: Continue to transmit data;
	• Setting: Set,
	  • Duration,
	  • Start time,
	  • Report generation,
	  • Alarm bell.
	(Note: Suspend is ONLY available after the test has been started, and Send Recovery is ONLY available after the test has been suspended.)
		
		Figure 6.9 Test

Result	• Overview: View alarm/BERT in the test;
	• RFC2544 Results: View RFC2544 test process and result,
	  • Throughput,
	  • Back-to-back,
	  • Frame loss,
	  • Latency;
	• Y.1564 Results: View the test result of Y.1564;
	• Service Disrupt: Test and view the service disrupt time.
		
		Figure 6.10 Result

Report	• Create Test Report: Create a test report when test is done; • Preview: Preview the created report; • Print: Print out the report.	 Figure 6.11 Report
About	• Help: Show help information; • About: Show corporation and version information ***(Figure 6.13 About)***; • Information: Show system and module information ***(Figure 6.14 & 6.15 System and Module Information)***.	 Figure 6.12 About

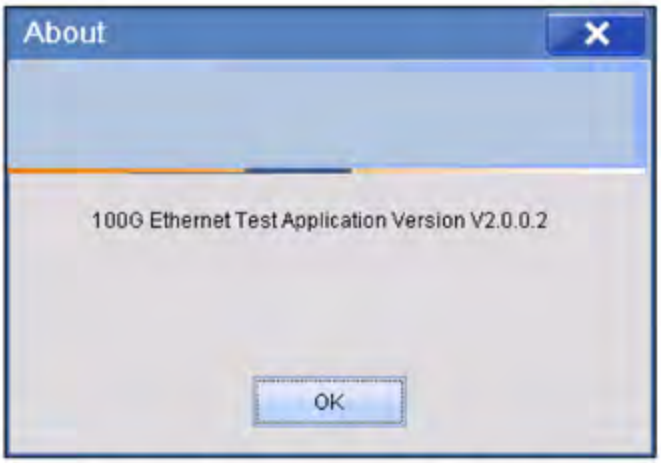


Figure 6.13 'About' Dialogue Box Diagram

Figure 6.14 System Information Dialogue

Figure 6.15 Module Information Dialogue

6.2.2 Ethernet Display Window

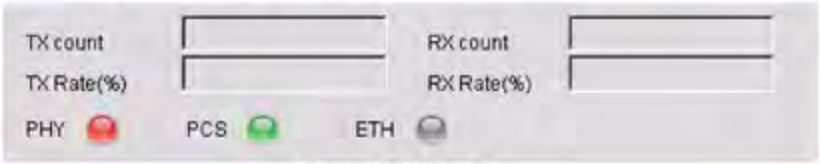
Ethernet Display Window of IVR-100G Ethernet is comprised by 2 parts: Port box; and Link box, which are demonstrated in Table 6.2 in detail.

Table 6.2 IVR-100GEthernet Display Window Description List

Sub Menu	Description

Port Box	• Data statistics information:
	  • TX count: Show the count of data frame has been transmitted of the port;
	  • RX count: Show the count of data frame has been received of the port;
	  • TX Rate (%): Show the bandwidth percentage of data transmission speed of the port;
	  • RX Rate (%): Show the bandwidth percentage of data receive speed of the port.

	• Alarm statistics information: Show PHY, PCS, and ETH alarms information,
	  • Grey: Show the test has not run yet;
	  • Green: Show no alarm/error has been occurred;
	  • Red: Show at least one alarm/error has been occurred.

	 Figure 6.16 Port Box

Link Box	• The link box displays:
	  • The port information of test module;
	  • Link state between the test port and the device.

	 Figure 6.17 Link Box

6.2.3 Ethernet Toolbar

Ethernet toolbar of IVR-100G Ethernet is comprised by Configuration box; Status bar; and Bottom ribbon these 3 parts. Detail information of each part is demonstrated in Table 6.3.

Table 6.3 IVR-100G Ethernet Toolbar Function List

<table>
<tr><th>Sub Menu</th><th>Description</th></tr>
<tr><td rowspan="3">Configuration Box</td><td>• Function: Select test functions, choose from,
• RFC2544: Support,
• Throughput; • Back to back; • Frame loss; • Latency;
• Loopback function: Support
• Layer1; • Layer2; • Layer3; • Layer4;
• Frame Analysis;
• BERT;
• User define;
• Y.1564;</td></tr>
<tr><td>• Clock mode: Select from,
• Internal mode; • External mode; • Recovered clock mode.</td></tr>
<tr><td>

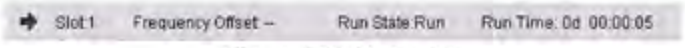
Figure 6.18 Ethernet Test Configuration</td></tr>
<tr><td>Status Bar</td><td>• The Status bar displays the information of:
• Slots; • Operation status; • Time.
• Frequency Offset;
 

Figure 6.19 Status Bar</td></tr>
<tr><td>Bottom Ribbon</td><td>• : Start test;
• : Stop test;
• : Open alarm overview;
• : Clear alarm/error information;
• : Turn on the laser;
• : Turn off the laser.
Figure 6.20 Bottom Ribbon</td></tr>
</table>

6.3 OTN Main Interface

After IVR-100G Ethernet/OTN Module has been started, and select to enter '100G OTN' the main interface of 100G OTN test will be displayed on the screen, which is comprised by Main menu; Display window; and Toolbar these 3 parts.

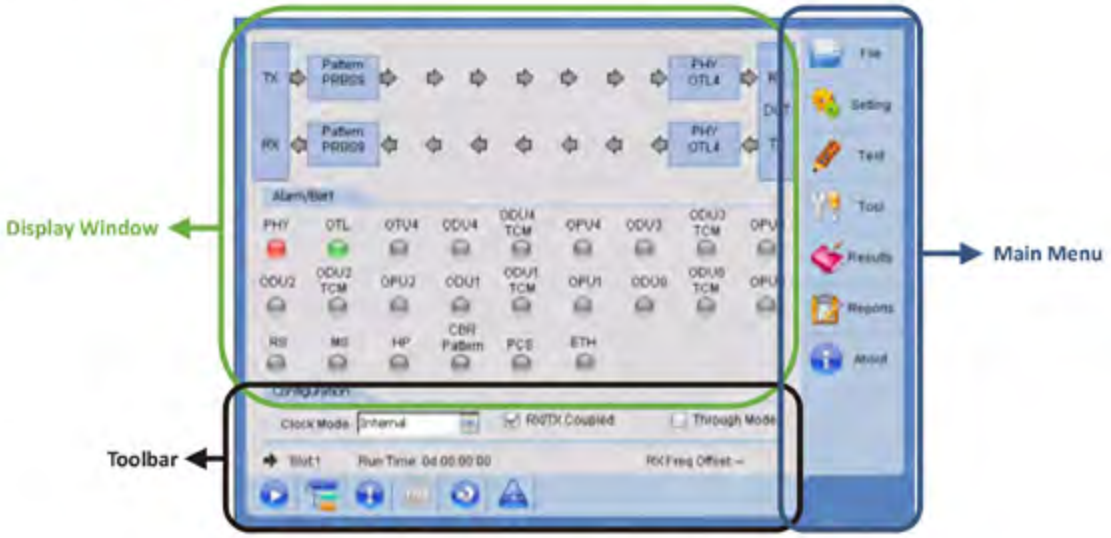


Figure 6.21 Main Interface of 100G OTN Application

6.3.1 OTN Main Menu

OTN Main Menu is on the right side of Display Window, and is comprised by 'Files'; 'Setting'; 'Test'; 'Tool'; 'Result'; 'Report'; 'and 'About' these 7 sub menus. Specific functions of each sub menu are demonstrated in Table 6.4.

Table 6.4 IVR-100G OTN Main Menu Functions List

Sub menu	Function	Diagram
File	See description in Table 6.1 Ethernet Main Menu: File	

Setting	• Port: Set parameters of port;
	• OTN4: Set and monitor overhead and alarm for:
	  • OTN4;
	• OTN3: Set and monitor overhead and alarm for;
	  • OTN3;
	• OTN2/OTN2E: Set and monitor overhead and alarm for:
	  • OTN2; • OTN2E;
	• OTN1: Set and monitor overhead and alarm for:
	  • OTU1; • ODU1; • OPU1;
	• OTN0/OTNFlex: Set and monitor overhead and alarm for:
	  • ODU0; • OPU0; • ODUFlex; • OPUFlex;
		Figure 6.22 Setting (*OTN*)

Interface

Sub menu	Function	Diagram

Setting	• OTN OH: Set and monitor OTN bit overhead;
	• SDH/SONET: Set and monitor overhead and alarm for:
	  • RS; • HP; • LOH;
	  • MS; • SOH; • POH;
	• PCS: Set parameters for PCS;
	• Ethernet: Set and monitor Ethernet data stream;
	• Alarm Bert: Insert alarm and BERT information;
	• Mapping Setting: Set mapping path;
	• External Clock: Set external clock.
		
		Figure 6.23 Setting (*OTN Continue*)

Test	• See Table 6.1 Ethernet Main Menu: Test	
Tool	• SDT: Test and view the service disrupt time; • Advanced Loopback: To run advance loopback function.	 Figure 6.24 Tool
Result	• Alarm Overview: View history and current alarm during the test; • PM Overview: Count the performance of test.	 Figure 6.25 Result
Report	• See Table 6.1 Ethernet Main Menu: Report	
About	• See Table 6.1 Ethernet Main Menu: About	

6.3.2 OTN Display Window

OTN Display Window of IVR-100G OTN is comprised by 2 parts: Alarm/Bert box; and Link box, which are demonstrated in Table 6.5 in detail.

Table 6.5 IVR-100G OTN Display Window Description List

Sub Menu	Description

Alarm/Bert Box	• Alarm statistics information: Show PHY, PCS, and ETH alarms information,
	  • Grey: Show the test has not run yet;
	  • Green: Show no alarm/error has been occurred;
	  • Red: Show at least one alarm/error has been occurred.

	 Figure 6.26 Port Box

Link Box	• The link box displays:
	  • Mapping path between TX and RX;
	  • Link state between the test port and the device.

	 Figure 6.27 Link Box

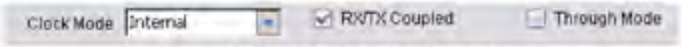
6.3.3 OTN Toolbar

OTN toolbar of IVR-100G OTN is comprised by Configuration box; Status bar; and Bottom ribbon these 3 parts. Detail information of each part is demonstrated in Table 6.6.

Table 6.6 IVR-100G Ethernet Toolbar Function List

Sub Menu	Description
Configuration Box	• Clock mode: Select from, • Internal mode; • External mode; • Recovered clock mode.
	• RX/TX Coupled: Select this option, RX/TX mapping path will be coupled; unselect this option, RX/TX mapping path will be independent for each other.
	• Though Mode: Enable though mode.

Interface

Sub Menu	Description
Configuration Box	 Figure 6.28 OTN Test Configuration
Status Bar	• The Status bar displays the information of: • Slots; • Operation status; • Time. • RX Frequency Offset; • RX Power; Figure 6.29 Status Bar
Bottom Ribbon	• : Start test; • : Stop test; • : Select mapping path; • : Open PM alarm; • : Open alarm overview; • : Clear alarm/error information; • : Turn on the laser; • : Turn off the laser. Figure 6.30 Bottom Ribbon

7. Start a Test Case

7.1 Test Case under Ethernet Application

7.1.1 Start a PHY test case

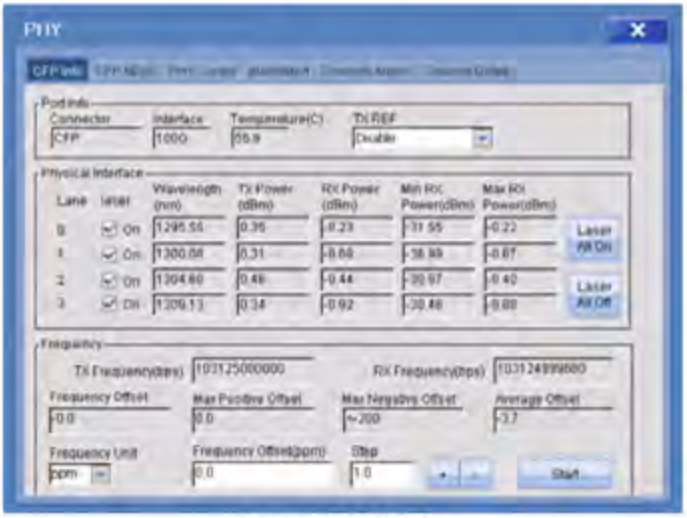
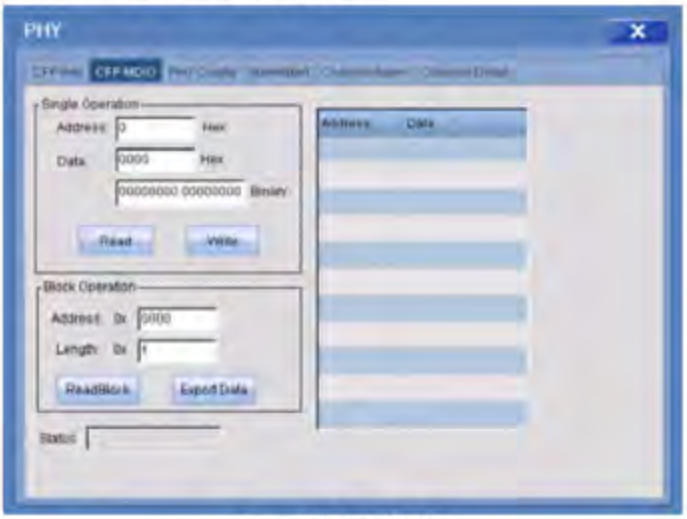
Start a PHY test case needs to follow the following steps:

- Select 'PHY' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;
- **Or** click the 'Link Box' directly to enter 'PHY Config';
- After all the parameters have been set completely, Click to run the test.

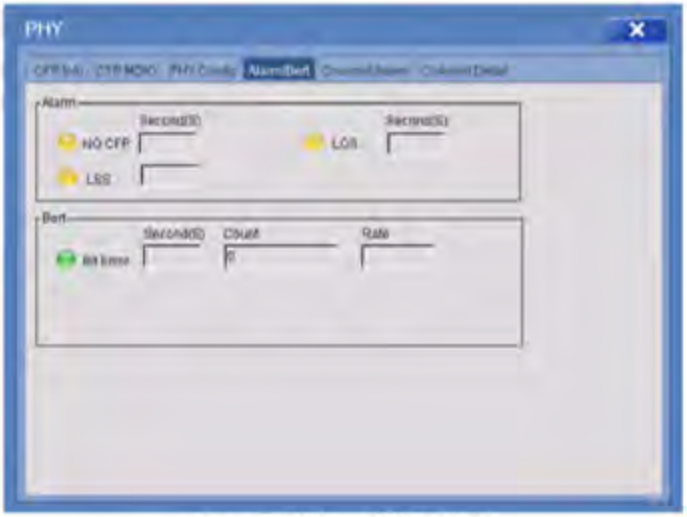
Table 7.1 PHY Configuration

Sub menu	Parameters
CFP Info	• Port Info: • Connector: Show the information of port connector; • Interface: Show speed rate of the interface; • Temperature: Show the CFP current temperature; • TX REF: Enable or disable TX REF, support, • Disable; • Network 1/8; • Network 1/16; • Network 1/64;
	• Physical Interface: • Laser: Turn on/off the laser; • Lane: Show number 0-3 4x25G optical signal channel; • Wavelength (nm): Show the detected CFP signal wavelength, support, • 1310nm; • 1550nm; • -- (Undefined CFP optical module); • Power: Show the power of the optical signal;
	• Frequency: • TX/RX Frequency (bps): Show the frequency of transmission and received signal; • Frequency Offset: Show the frequency offset between standard speed and the rate of the received signal; • Max Positive Offset: Show the maximum frequency offset between standard speed rate and received signal; • Max Negative Offset: Show the minimum frequency offset between standard speed rate and received signal; • Average Offset: Show the average frequency offset of the received signal; • Frequency Unit: ppm and bps.

Test

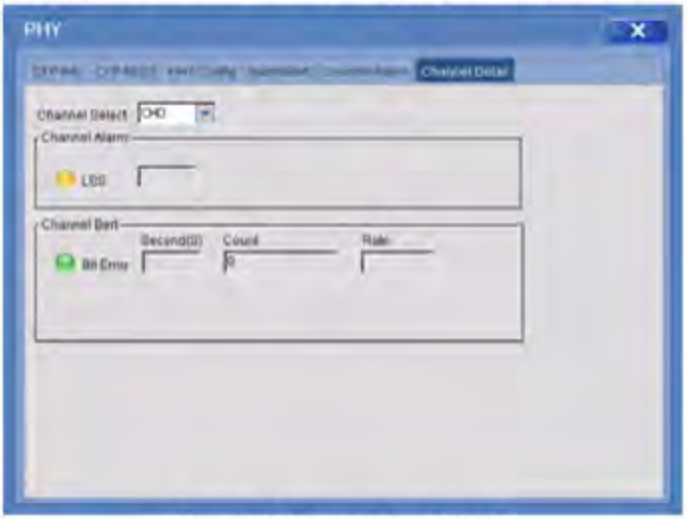
Sub menu	Parameters
CFP Info	 Figure 7.1 CFP Info
CFP MDIO	• Read or write data (MDIO) into CFP;  Figure 7.2 CFP MDIO
PHY Config	• TX: • Test mode: Default as 20 virtual lanes; • Pattern: available • PRBS2^9; • PRBS2^20; • PRBS2^29; • JTPAT; • PRBS2^11; • PRBS2^23; • HF; • SPAT; • PRBS2^15; • PRBS2^31; • CRPAT; • User define; • Value: Set pattern value by user, default HEX; • Invert: Enable this option, all value in the pattern will be reversed, 1 to 0, 0 to 1; • RX: same as TX, see TX description;

Sub menu	Parameters
PHY Config	 Figure 7.3 PHY Configuration

Alarm/ BERT	• Alarm:
	  • No CFP: Alarm for no CFP optical module inserted;
	  • LOS: Alarm for LOS, no signal input;
	  • LSS: Alarm for LSS, pattern loss;
	• BERT:
	  • Bit Error: Display quantity, time, and rate of bit error.
	 
	Figure 7.4 Alarm/BERT (***PHY***)

Channel Alarm	• Display test channel alarm information includes: LSS, BIT;

Test

Sub menu	Parameters
Channel Alarm	 Figure 7.5 Channel Alarm (***PHY***)
Channel Detail	• Display one specific channel alarm and BERT information;  Figure 7.6 Channel Detail (***PHY***)
Network Setting ***(Note: Will be displayed when select RFC2544 ect. Test)***	• Network Setting: Set network parameters, • IP version; • Subnet mask; • MAC; • IP address; • Gateway; • DNS; • Stack VLAN (Q-in-Q): Select VLAN stack layers, support, • Layer 1; • Layer 2; • Layer 3; ***(Note: The programme allows to select 3 VLAN stack layers in maximum at same time.)*** • VLAN #1/#2/#3: Input VLAN ID, choose values from 1 to 4094; ***(Note: 4095 is retention value, and 0 and 1 are reserved for special purposes.)*** • Priority: Select PRL of VLAN, • 0: 000-Low PRL • 3: 011-Low PRL • 6: 110- High PRL • 1: 001-Low PRL • 4: 100- High PRL • 7: 111- High PRL • 2: 010-Low PRL • 5: 101- High PRL • Type: Choose the types of Ethernet, support, • 8100; • 88A8; • 9100; • 9200; • 9300; • CFI: Canonical Format Indicator, • Select this option, CFI value is 1, means non canonical format; • Unselect this option, CFI value is 0, means canonical format. ***(Note: This option is unselected by default.)***

Sub menu	Parameters
Network Setting	

Figure 7.7 Network Setting

7.1.2 Start a PCS test case

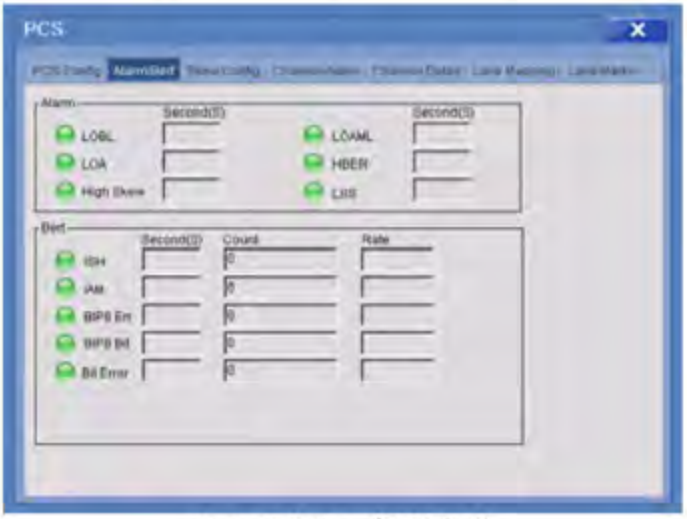
Start a PCS test case needs to follow the following steps:

- Select 'PCS' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PCS Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.2 PCS Configuration;
- **Or** click the 'Link Box' directly to enter 'PCS Config';
- After all the parameters have been set completely, Click to run the test.

Table 7.2 PCS Configuration

Sub menu	Parameters
PCS Config	See description in Table 7.1 PHY Configuration: PHY Config

Test

Sub menu	Parameters
PCS Config	 Figure 7.8 PCS Configuration
Alarm/ BERT	• Alarm: Count duration of, • LOBL; • High Skew; • HBER; • LOA; • LOAML; • LSS; • BERT: Count quantity, duration, and rate of, • ISH; • BIP8 Err; • Bit Error; • IAM; • BIP8 Bit;  Figure 7.9 Alarm/BERT (***PCS***)
Skew Config	• Set skew value for lane 1 to lane 9, or set skew value for all lanes;

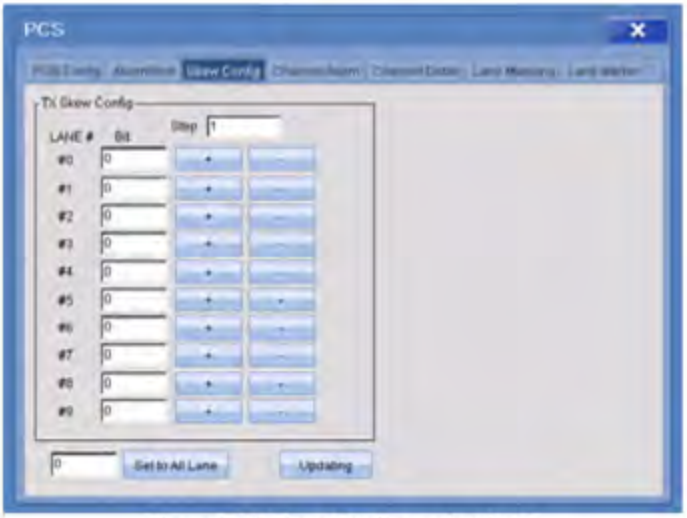
<table>
<tr><th>Sub menu</th><th>Parameters</th></tr>
<tr><td>Skew Config</td><td> 

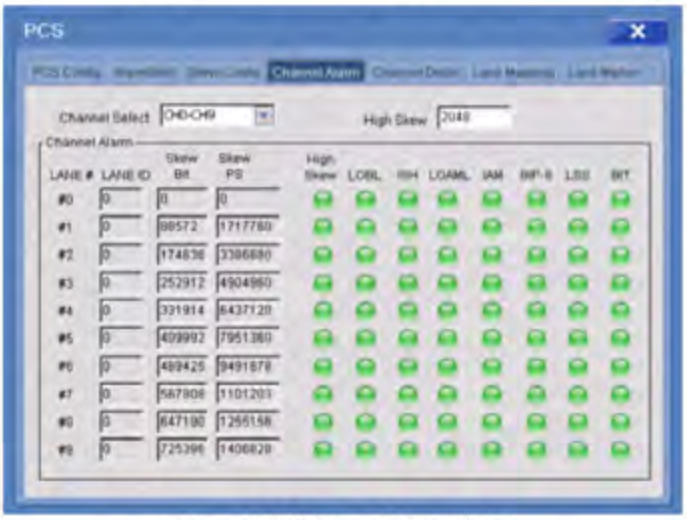
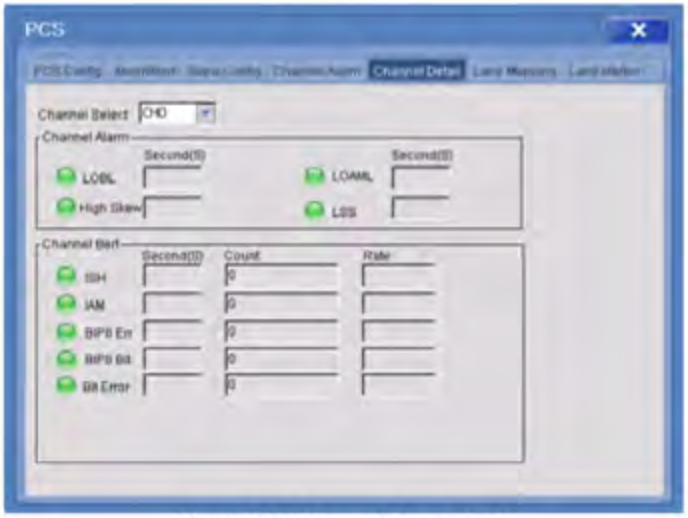
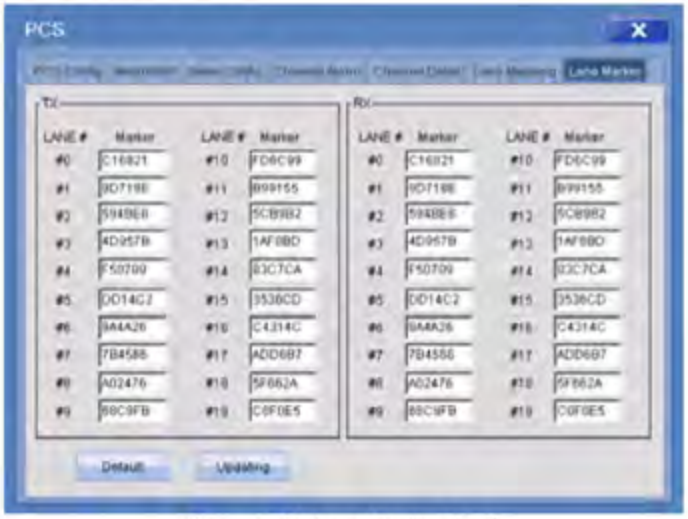
Figure 7.10 Skew Configuration (PCS)</td></tr>
<tr><td rowspan="3">Channel Alarm</td><td>• Channel Select:
• CH0-CH9; • CH10-CH19;</td></tr>
<tr><td>• Channel alarm: Display test channel alarm information, include,
• Lane#: Actual channel ID;
• Lane ID: Logic channel ID;
• Alarm:
• LOBL; • LOAML; • BIP-8; • BIT;
• ISH; • IAM; • LSS; • High Skew;</td></tr>
<tr><td> 

Figure 7.11 Channel Alarm (PCS)</td></tr>
<tr><td rowspan="3">Channel Detail</td><td>• Channel Select: Select channel from CH0-CH19;</td></tr>
<tr><td>• Channel Alarm: Display duration of alarms:
• LOBL; • High Skew; • LOAML; • LSS;</td></tr>
<tr><td>• Channel BERT: Display BERT information, include duration, count, rate:
• ISH; • BIP 8 Err; • Bit Error;
• IAM; • BIP 8 Bit;</td></tr>
</table>

Sub menu	Parameters
Channel Detail	 Figure 7.12 Channel Detail (***PCS***)
Lane Mapping	• Set logic channel ID for actual channel; Figure 7.13 Lane Mapping (***PCS***)
Lane Marker	• Set marker for actual channel.  Figure 7.14 Lane Marker (***PCS***)

7.1.3 Start a RFC2544 test case

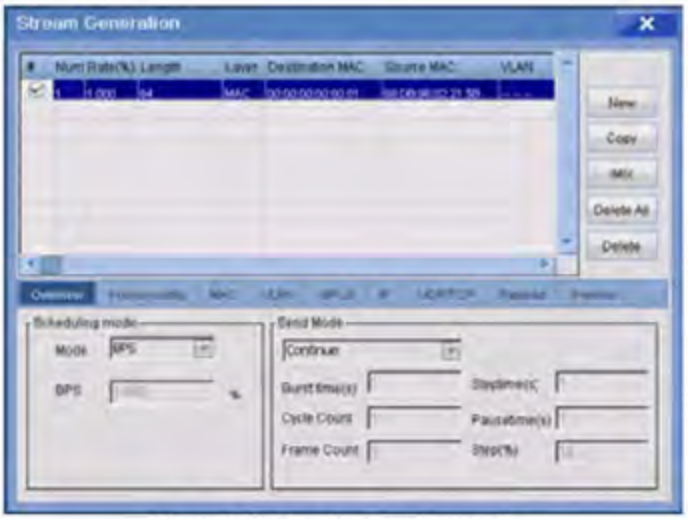
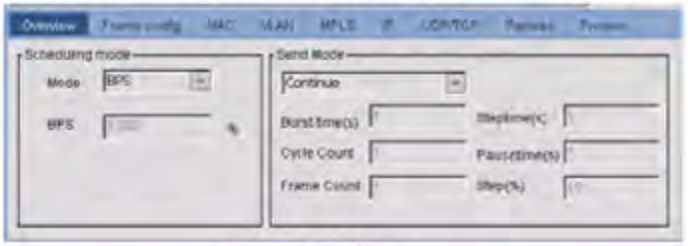
Start a RFC2544 test case needs to follow the following steps:

- Select 'RFC2544' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;
- After port parameters have been set completely; select 'Stream Generation' from 'Setting' sub menu to configure data stream parameters, the detail instruction for setting data stream is demonstrated in Table 7.3 Data Stream Generation;
- After all parameters of data stream have been set completely, select 'RFC2544 Setup' from 'Setting' sub menu to configure RFC2544 parameters, the detail instructions for setting RFC2544 is demonstrated in Table 7.4 RFC2544 Setting;
- After all the parameters have been set completely, Click to run the test.

Table 7.3 Data Stream Generation

Sub Menu	Parameters
General Description	***RFC2544, Frame Analysis, and Bit Error require to configure data stream generation. Data stream generation includes Overview; Frame configuration; MAC; VLAN; IP; UDP/TCP; Payload; and Preview. 512 data stream will be generated in the Frame analysis test, but only 1 data stream will be generated in RFC2544 and Bit error test.***
	• Stream Generation Information: Show the data stream information, • Enable button; • Number; • Rate (%); • Length; • Layer; • VLAN; • MPLS; • SNAP; • Payload; Source: • IP; • Port; • Mac; Destination: • IP; • Port; • Mac;
	• New: Click to setup new streams; • Copy: Click to copy the current stream; • Delete: Click to delete the current stream.

Test

Sub Menu	Parameters
General Description	 Figure 7.15 Data Stream Generation
Overview	• Scheduling Model: • Mode: Select modes, support, • BPS (Bit Per Second); • FPS (Frame Per Second); • FPS: Set an FPS value; ***(Note: Only available in FPS mode.)*** • BPS: Show BPS value (%);
	• Sending Model: • Send Mode: Select sending mode for the data stream, support, • Continue: Transmit the frames continuously based on the bandwidth which has been selected; • Frame Mode: Transmit the frames which have been selected; • Burst Mode: Set duty cycle and burst time firstly, and transmit the frames based on the maximum bandwidth; • N-Burst Mode: Transmit the burst frames which have been selected; • Increasing Mode: Set steptime, stepcount, and max bandwidth, and transmit the frames which have been selected based on incremental ladder mode; • N-Increase Mode: Transmit the selected incremental counts. ***(Note: The default setting is continue mode.)*** • Burst time (s): Set burst time; ***(Note: This option is ONLY available under Burst mode and N-Burst mode.)*** • Cycle Count: Set burst or incremental cycle; ***(Note: This option is ONLY available under N-Burst mode and N-Increase mode.)*** • Frame Count: Set value for frame count; ***(Note: This option is ONLY available under Frame mode.)*** • Step time (s): Set duration time for each step; ***(Note: This option is ONLY available under Increase mode and N-Increase mode.)*** • Pause time (s): Set pause time; ***(Note: This option is ONLY available under N-Burst mode.)*** • Step (%): Set incremental step value; ***(Note: This option is ONLY available under Increase mode and N-Increase mode.)***
	 Figure 7.16 Overview

<table>
<tr><th>Sub Menu</th><th>Parameters</th></tr>
<tr><td rowspan="5">Frame Config</td><td>• Rate/Weight (%): Input the rate of data stream;</td></tr>
<tr><td>• Layer: Select the layer for transmitting the data stream, support,
• ONE; • MAC; • UDP; • TCP; • IP;</td></tr>
<tr><td>• Length:
• Type: Select the length mode of the data stream, support,
• Fixed; • Incremental; • Decremented; • Random;
• Size: Set the length of the stream, choose value from 46 bytes to 16000bytes;
(Note: ONLY under FPS scheduling mode has been selected in Bit error test, the frame size can be set less than 64 bytes.)
• Max: set the maximum value of the frame length;
(Note: This option is NON-available in the fixed mode.)
• Min: set the minimum value of the frame length;
(Note: This option is NON-available in the fixed mode.)
• Stepping: Set value for incremental and decremented frame length;
• Fixed; • Incremental; • Decremented; • Random.</td></tr>
<tr><td>
Figure 7.17 Frame Configuration</td></tr>
<tr><td rowspan="7">MAC</td><td>• Mode: Select the generation modes of MAC address, support,
• Fixed; • Incremental; • Decremented; • Random;</td></tr>
<tr><td>• MAC Address: Input destination/source MAC address;</td></tr>
<tr><td>• Max: Set the maximum value of the MAC address;
(Note: This option is NON-available in the fixed mode.)</td></tr>
<tr><td>• Min: Set the minimum value of the MAC address;
(Note: This option is NON-available in the fixed mode.)</td></tr>
<tr><td>• Step: Set step values for the incremental and decremented MAC address;
(Note: This option is ONLY available under the incremental and decremented modes.)</td></tr>
<tr><td>• Resolve: Analyse MAC address in accordance with an IP address which has been selected in the network;
(Note: This option is ONLY available in the destination box.)</td></tr>
<tr><td>• Status: Display the analysis result of resolving MAC, include,
• -- (not enabled); • Analysing; • Analysed; • Failed;
(Note: This option is ONLY available in the destination box.)</td></tr>
<tr><td>
Figure 7.18 MAC</td></tr>
<tr><td rowspan="2">VLAN</td><td>• Stack VLAN (Q-in-Q): Select VLAN stack layers, support,
• Layer 1; • Layer 2; • Layer 3;
(Note: The programme allows to select 3 VLAN stack layers in maximum at same time.)</td></tr>
<tr><td>• VLAN Layer No.: select the layer of VLAN from 1~3 layers,
• Layer 1; • Layer 2; • Layer 3;</td></tr>
</table>

Test

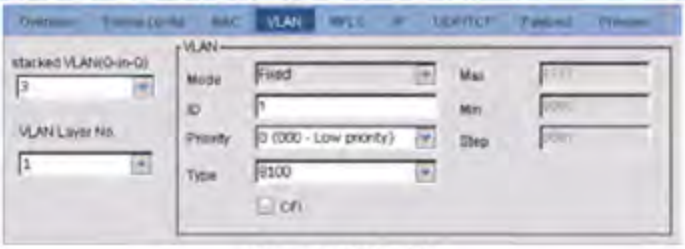
<table>
<tr><th>Sub Menu</th><th>Parameters</th></tr>
<tr><td rowspan="4">VLAN</td><td>• VLAN:
• Mode: Select the VLAN ID modes of data stream, support,
• Fixed; • Incremental; • Decremented; • Random;
• ID: Input VLAN ID, choose values from 1 to 4094;
(Note: 4095 is retention value, and 0 and 1 are reserved for special purposes.)
• Priority: select the priority of VLAN,
• 0: 000-Low PRL; • 3: 011-Low PRL; • 6: 110- High PRL;
• 1: 001-Low PRL; • 4: 100- High PRL; • 7: 111- High PRL;
• 2: 010-Low PRL; • 5: 101- High PRL;
• Mode: Select VLAN Ethernet type, support,
• 8100; • 9100; • 9300;
• 88A8; • 9200;
• Max: Set the maximum value of the VLAN ID;
(Note: This option is NON-available in the fixed mode.)
• Min: Set the minimum value of the VLAN ID;
(Note: This option is NON-available in the fixed mode.)</td></tr>
<tr><td>• CFI: Canonical Format Indicator,
• Select this option, CFI value is 1, means non canonical format;
• Unselect this option, CFI value is 0, means canonical format.
(Note: This option is not enabled by default.)</td></tr>
<tr><td> 

Figure 7.19 VLAN</td></tr>
<tr><td rowspan="4">MPLS</td><td>• LLC Header: Default value is AAAA 03 (16hex);
(Note: LLC Header is ONLY available when SNAP Header has been enabled. LLC Header value cannot be modified.)</td></tr>
<tr><td>• SNAP Header: Enable SNAP Header, Figure 7.20 shows its format;
(Note: SNAP Header is NON-available in layer 1. Enable SNAP Header will enable LLC Header automatically.)

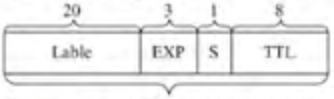
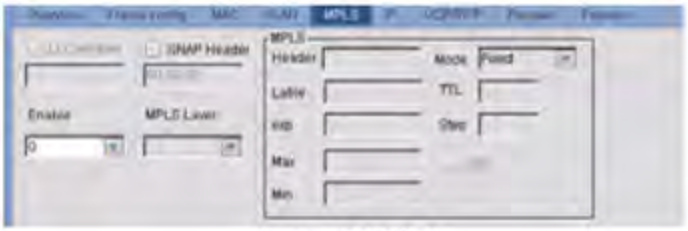
Figure 7.20 IEEE 802.3/802.2 SNAP Frame Format</td></tr>
<tr><td>• Enable: Enable quantity of MPLS layers, support,
• 0 • 1 • 2 • 3
(Note: MPLS is ONLY available when data transmission layer has been select MAC layer in Frame Config).</td></tr>
<tr><td>• MPLS Layer: Select MAC layer which has been enabled,
• Layer 1; • Layer 2; • Layer 3;</td></tr>
<tr><td>• MPLS:
• Header: indicates the configured header information of MPLS;
• Label: Set value for MPLS label, Figure 7.21 shows the its format;
 

Figure 7.21 MPLS Label Format</td></tr>
</table>

Sub Menu	Parameters
MPLS	• Exp (Experiment level): Select the experiment level, and the default setting is 0 (16hex), • 0: 000-Low PRL; • 1: 001-Low PRL; • 2: 010-Low PRL; • 3: 011-Low PRL; • 4: 100- High PRL; • 5: 101- High PRL; • 6: 110- High PRL; • 7: 111- High PRL; • Mode: Select MPLS label modes, • Fixed; • Incremental; • Decremented; • Random; • TTL (Time to Live): Set the value of TTL from 00 to FF (16 hex).
	 Figure 7.22 MPLS
IP	• IPV4/IPV6: Select IP modes, support, • IPV4; • IPV6;
	• Destination/Source: • Mode: Select IP generation modes, support, • Fixed; • Incremental; • Decremented; • Random; • IP Address: Set the maximum value of source/destination IP address; ***(Note: This option is NON-available in the fixed mode.)*** • Max: Set the maximum value of MPLS label; ***(Note: This option is NON-available in the fixed mode.)*** • Min: Set the minimum value of the MPLS label; ***(Note: This option is NON-available in the fixed mode.)*** • Step: Set the step values for incremental and decremented IP address; ***(Note: This option is ONLY available under the incremental and decremented modes.)*** • TTL (Time to Live): Set value for TTL, range from 0 to 255; ***(Note: This option is ONLY available in the destination box.)*** • Binary: enable this option, and the value of IP TOS/DS is binary. ***(Note: This option is ONLY available in the destination box.)*** • IP TOS/DS: Input the user-defined value, range from 00~FF (16 hex); ***(Note: This option is ONLY available in the destination box and the default value is 00.)***
	• Ping Button: Click to Ping the destination IP address ***(Section 10.1: Ping Setup)***; ***(Note: This option is ONLY available in the destination box.)***
	• Advanced TOS/DS button: ***(Note: This option is ONLY available in the destination box.)*** • Enable Differentiated Services: • Enable: Enable DS and disable TOS; • Disable: Enable TOS and disable DS; • DSCP Code Points: Set the DSCP code points, the default value is CS0, • 000000: CS0; • 001000: CS1; • 010000: CS2; • 011000: CS3; • 100000: CS4; • 101000: CS5; • 110000: CS6; • 111000: CS7; • 001010: AF11; • 001100: AF12; • 001110: AF13; • 010010: AF21; • 010100: AF22; • 010110: AF23; • 011010: AF31; • 011100: AF32; • 011110: AF33; • 100010: AF41; • 100100: AF42; • 100110: AF43; • 101110: EF; • User-defined: User-defined;

<table>
<tr><th>Sub Menu</th><th>Parameters</th></tr>
<tr><td rowspan="2">IP</td><td>
• User-defined Codes: Set User-defined DSCP code points, range from 00 to 3F (16hex);
(Note: This option is ONLY available, when User-defined has been selected in DSCP Code Points.)
• ECN: Set value for ECN field, the default setting is 00 (Not-ECT),
• 00: Not-ECT; • 01: ECT-1; • 10: ECT-0; • 11: CE;
• Priority: Set the priority, the default setting is 000 (routine),
• 000: Routine; • 011: Flash; • 110: Ethernet Control;
• 001: Priority; • 100: Flash Override; • 111: Network Control;
• 010: Immediate; • 101: CRITIC/ECP;
• Delay: Set delay level, the default setting is normal,
• Normal; • Low;
• Throughput: Set throughput level, the default setting is normal,
• Normal; • High;
• Reliability: Set reliability level, the default setting is normal,
• Normal; • High;
• Monetary Cost: Set monetary cost level, the default setting is normal,
• Normal; • Low;
• Reserved bit: Set reserved bit value, the default value is 0,
• 0; • 1.
</td></tr>
<tr><td>

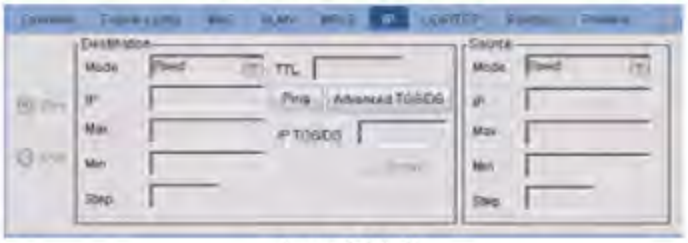
Figure 7.23 Advanced TOS/DS


Figure 7.24 IP
</td></tr>
<tr><td rowspan="4">UDP/TCP</td><td>• Mode: Select IP generation modes, support,
• Fixed; • Incremental; • Decremented; • Random;</td></tr>
<tr><td>• IP Address: Set the maximum value of source/destination IP address;
(Note: This option is NON-available in the fixed mode.)</td></tr>
<tr><td>• Max: Set the maximum value of MPLS label;
(Note: This option is NON-available in the fixed mode.)</td></tr>
<tr><td>• Min: Set the minimum value of the MPLS label;
(Note: This option is NON-available in the fixed mode.)</td></tr>
<tr><td></td><td>• Step: Set the step values for incremental and decremented IP address;
(Note: This option is ONLY available under the incremental and decremented modes.)</td></tr>
</table>

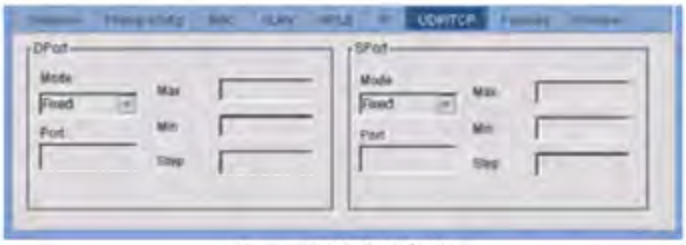
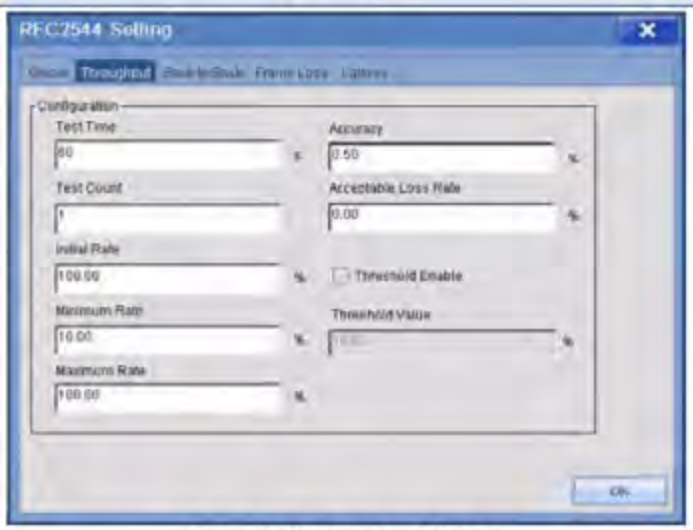
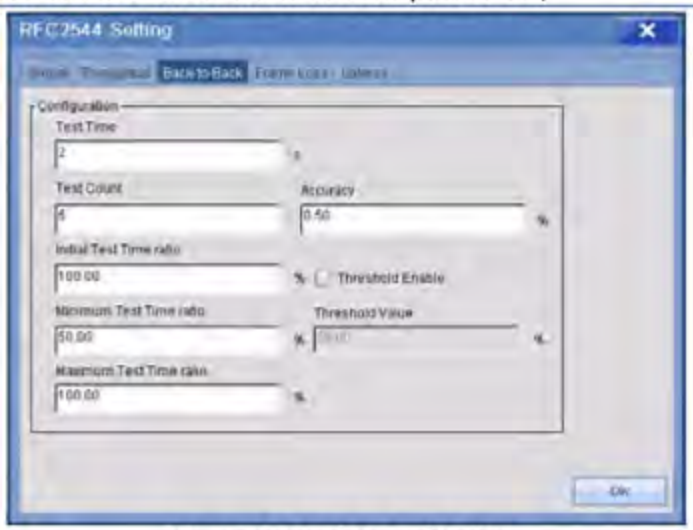
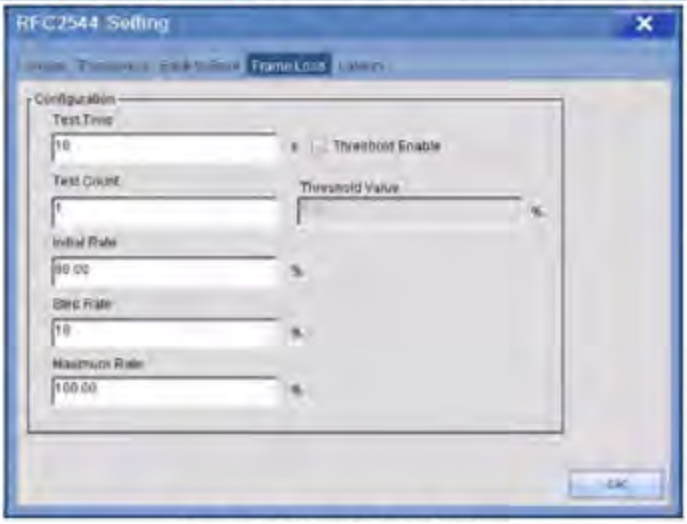
Sub Menu	Parameters
UDP/TCP	 Figure 7.25 UDP/TCP
Payload	• Test Pattern: Select the test type, support, • PRBS 2^9; • PRBS 2^20; • PRBS 2^29; • JTPAT; • PRBS 2^11; • PRBS 2^23; • HF; • SPAT; • PRBS 2^15; • PRBS 2^31; • CRPAT; • User-defined;
	• Value: Input the user-defined pattern in binary or 16 hex, the default setting is 16 hex; ***(Note: This option is ONLY available when select the user-defined pattern.)***
	• Inverse: Select to Invert the test pattern, for example '0' inverts to '1', and '1' inverts to '0'; ***(Note: This option is disabled by default.)***
	• Mode: Select IP generation modes, support, • Fixed; • Incremental; • Decremented; • Random;
	• IP Address: Set the maximum value of source/destination IP address; ***(Note: This option is NON-available in the fixed mode.)***
	• Max: Set the maximum value of MPLS label; ***(Note: This option is NON-available in the fixed mode.)***
	• Min: Set the minimum value of the MPLS label; ***(Note: This option is NON-available in the fixed mode.)***
	• Step: Set the step values for incremental and decremented IP address; ***(Note: This option is ONLY available under the incremental and decremented modes.)***
	 Figure 7.26 Payload
Preview	• Check the header information of the generated data stream packet.
	 Figure 7.27 Preview

Table 7.4 RFC2544 Setting

Sub Menu	Parameters
Global	• Distribution: Select the frame size distribution, support, • RFC2544; • User-defined;
	• Amount: Select the quantity of frame size, range from 1 to 7; ***(Note: This option is ONLY available when user-defined distribution has been selected.)***
	• Frame Size (Bytes): Set frame size, range from 64 to 16000; ***(Note: This option is ONLY available when user-defined distribution has been selected. If RFC2544 distribution has been selected, the frame size will be set by default, which are 64; 128; 256; 512; 1024; 1280; and 1518.)***
	 Figure 7.28 Global Setting
Throughput	• Test Time (s): Set the Throughput test time, range from 1 to 999, the default value is 60s;
	• Test Count: Select the times for Throughput test, range from 1 to 60, the default value is 1;
	• Initial Rate: Set the initial rate for Throughput test, range from 0.01% to 100%, the default value is 100%;
	• Minimum Rate: Show the minimum time run which the programme required to run under the best condition, range from 0.01% to 100%, the default value is 10%; ***(Note: The minimum time will be calculated and upgraded when the test has been started.)***
	• Maximum Rate: Set the maximum rate for Throughput test, range from 0.01% to 100%, the default value is 100%;
	• Accuracy: Set the accuracy value, range from 0.01% to 100%, the default value is 0.5%; ***(Note: The accuracy will be calculated based on the Ethernet link rate.)***
	• Acceptable Loss Rate: Set an acceptable package loss rate, range from 0.00 to 100, the default value is 0.00;
	• Threshold: Set test threshold to see test pass or fail;

Sub Menu	Parameters
Throughput	 Figure 7.29 Throughput Setting
Back-to-Back	• Test Time (s): Set the Back-to-Back test time, range from 1 to 999, the default value is 2s; • Test Count: Select the times for Back-to-Back test, range from 1 to 60, the default value is 5; • Initial Rate: Set the initial rate for Back-to-Back test, range from 0.01% to 100%, the default value is 100%; • Minimum Rate: Show the minimum time run which the programme required to run under the best condition, range from 0.01% to 100%, the default value is 50%; ***(Note: The minimum time will be calculated and upgraded when the test has been started.)*** • Maximum Rate: Set the maximum rate for Back-to-Back test, range from 0.01% to 100%, the default value is 100%; • Accuracy: Set the accuracy value, range from 0.01% to 100%, the default value is 0.5%; ***(Note: The accuracy will be calculated based on the Ethernet link rate.)*** • Threshold: Set test threshold to see test pass or fail;  Figure 7.30 Back-to-Back Setting

Test

Sub Menu	Parameters
Frame Loss	• Test Time (s): Set the Frame Loss test time, range from 1 to 999, the default value is 10s;
	• Test Count: Select the times for Frame Loss test, range from 1 to 60, the default value is 1;
	• Initial Rate: Set the initial rate for Frame Loss test, range from 0.01% to 100%, the default value is 80%;
	• Step Rate: Set step rate for frame Loss test, range from 1% to 100%, the default value is 10%;
	• Maximum Rate: Set the maximum rate for Frame Loss test, range from 0.01% to 100%, the default value is 100%;
	• Threshold: Set test threshold to see test pass or fail;
	 Figure 7.31 Frame Loss Setting
Latency	• Test Time (s): Set the Latency test time, range from 1 to 999, the default value is 20s;
	• Test Count: Select the times for Latency test, range from 1 to 60, the default value is 3;
	• Initial Rate: Set the initial rate for Latency test, range from 0.01% to 100%, the default value is 80%;
	• Step Rate: Set step rate for Latency test, range from 1% to 100%, the default value is 10%;
	• Maximum Rate: Set the maximum rate of Latency test, range from 0.10% to 100%, the default value is 100%. ***(Note: Normally, the maximum rate of Latency test is set less than the actual throughput rate, for considering the differences of switches' buffer sizes and forwarding mechanism. For example, set as 99% of throughput rate.)***
	• Threshold: Set test threshold to see test pass or fail.

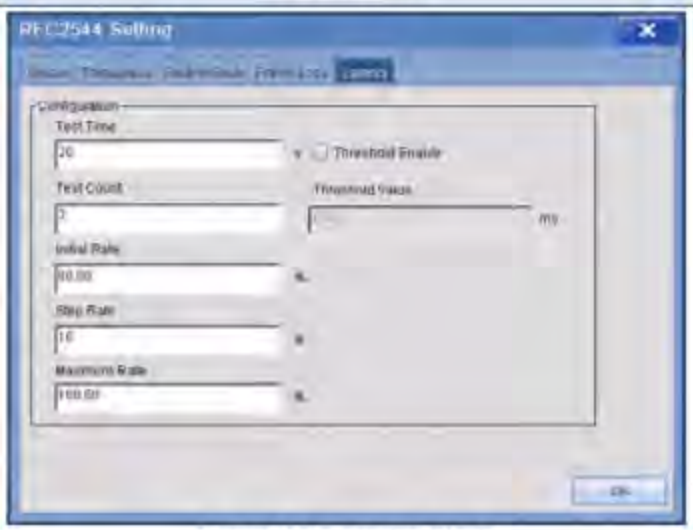
Sub Menu	Parameters
Latency	

Figure 7.32 Latency Setting

7.1.4 Start a Frame Analysis Test Case

Start a Frame Analysis test case needs to follow the following steps:

- Select 'Frame Analysis' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;
- After port parameters have been set completely; select 'Stream Generation' from 'Setting' sub menu to configure data stream parameters, the detail instruction for setting data stream is demonstrated in Table 7.3 Data Stream Generation;
- After all the parameters have been set completely, Click to run the test.

7.1.5 Start a Bit Error Test Case

Start a Bit Error test case needs to follow the following steps:

- Select 'Bit Error' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;
- After port parameters have been set completely; select 'Stream Generation' from 'Setting' sub menu to configure data stream parameters, the detail instruction for setting data stream is demonstrated in Table 7.3 Data Stream Generation;
- Click to start data transmission, then select 'Eth Error Injection' from 'Setting' sub menu to insert bit error, detail configuration can be seen in Section 8.2 Ethernet Bit Error Injection;
- Then Bit Error test has been started.

7.1.6 Strat a Loopback Test Case

Start a Loopback test case needs to follow the following steps:

- Select 'Loopback' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;
- After all the parameters have been set completely, Click to run the test.

7.1.7 Start a Y.1564 Test Case

Start an Y.1564 test case needs to follow the following steps:

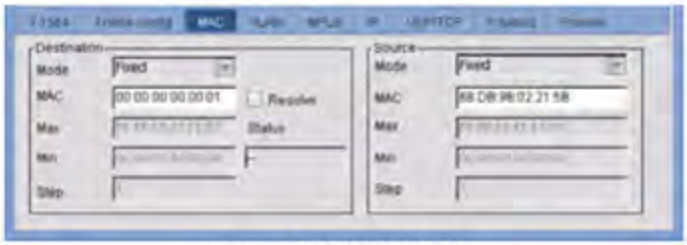
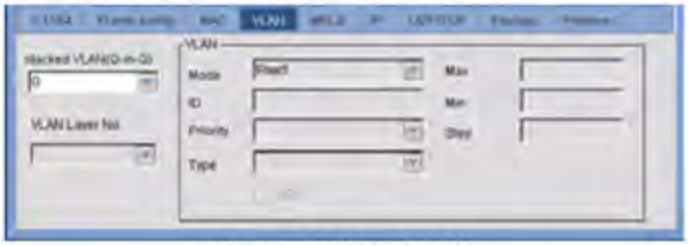
- Select 'Y.1564' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;

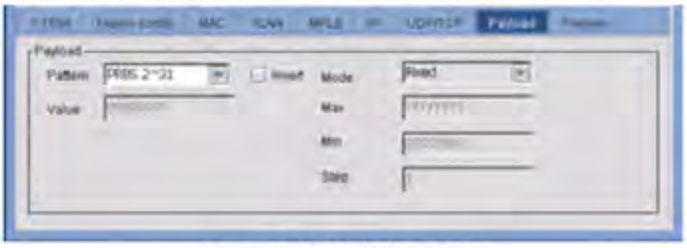
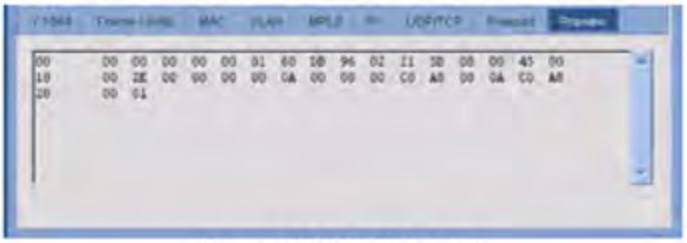
- After port parameters have been set completely; select 'Service Setup' from 'Setting' sub menu to configure Y.1564 parameters, the detail instruction for setting data stream is demonstrated in Table 7.5 Y.1564 Service Setup;
- After all the parameters have been set completely, Click to run the test.

Table 7.5 Y.1564 Service Setup

<table>
<tr><th>Sub Menu</th><th>Parameters</th></tr>
<tr><td rowspan="4">General Description</td><td>Y.1564 includes Y.1564; Frame configuration; MAC; VLAN; IP; UDP/TCP; Payload; and Preview.</td></tr>
<tr><td>• Stream Generation Information: Show the data stream information,
• Enable button;
• Number;
• Rate (%);
• Length;
• Layer;
• VLAN;
• MPLS;
• SNAP;
• Payload;
Source:
• IP;
• Port;
• Mac;
Destination:
• IP;
• Port;
• Mac;</td></tr>
<tr><td>• New: Click to setup new streams;
• Copy: Click to copy the current stream;
• Delete: Click to delete the current stream.</td></tr>
<tr><td>
Figure 7.33 Y.1564</td></tr>
<tr><td rowspan="3">Global</td><td>• Global configuration:
• Configuration Step Test Time (s): Set time for step test, range from 1 to 60;
• Time of Performance test (m): Set time for performance test, range from 1 to 1440;
• Test direction: Support from TX to RX;</td></tr>
<tr><td>• CIR Test：
• CIR step Enable: Select to enable CIR step test;
• Step 1/2/3/4: Set step time, range from 0.01 to 1;</td></tr>
<tr><td>• Configure Service:
• CIR (Mbps): Set CIR value;
(Note: The minimum value is 0.001 and the maximum value is determined by the packet length.)
• EIR (Mbps): Set EIR value,
(Note: The minimum value is 0.001 and the maximum value is determined by the packet length.)
• Max FLR (ms): Set max FLR value, range from 0.0E+000 and 5.0E-001;
• Max FDV (ms): Set max FDV value, range from 1 and 1000.</td></tr>
</table>

Test

Sub Menu	Parameters
Global	 Figure 7.34 Y.1564 Global
Frame Config	• See Table 7.3 Data Stream Generation: Frame Config; Figure 7.35 Y.1564 Frame Configuration
MAC	• See Table 7.3 Data Stream Generation: MAC;  Figure 7.36 Y.1564 MAC
VLAN	• See Table 7.3 Data Stream Generation: VLAN;  Figure 7.37 Y.1564 VLAN
MPLS	• See Table 7.3 Data Stream Generation: MPLS; Figure 7.38 Y.1564 MPLS
IP	• See Table 7.3 Data Stream Generation: IP;

Sub Menu	Parameters
IP	 Figure 7.39 Y.1564 IP
UDP/TCP	• See Table 7.3 Data Stream Generation: UDP/TCP; Figure 7.40 Y.1564 UDP/TCP
Payload	• See Table 7.3 Data Stream Generation in Payload;  Figure 7.41 Y.1564 Payload
Preview	• See Table 7.3 Data Stream Generation: Preview.  Figure 7.42 Y.1564 Preview

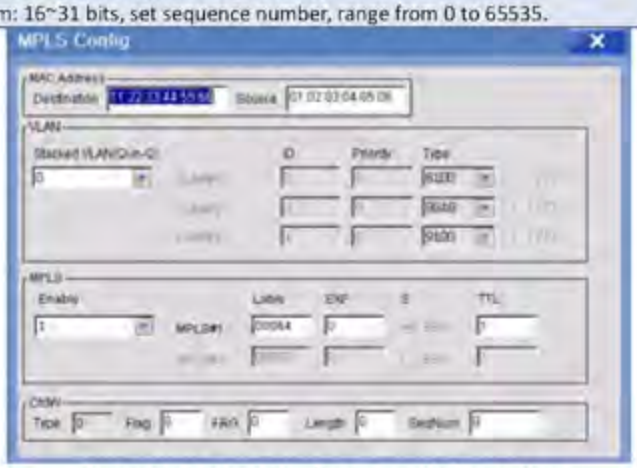
7.1.8 Strat a User-defined Frame Test Case

Start a User-defined Frame test case needs to follow the following steps:

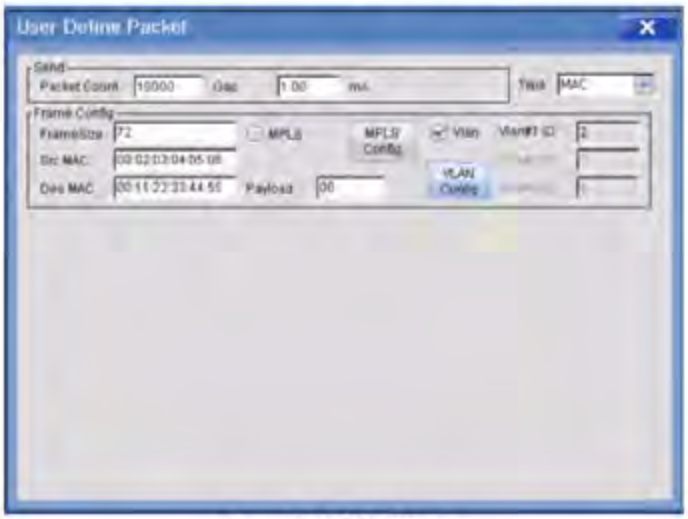
- Select 'User-defined' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'PHY Config' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.1 PHY Configuration;
- After port parameters have been set completely; select 'User Define Packet' from 'Setting' sub menu to configure user-defined packet parameters, the detail instruction for setting data stream is demonstrated in Table 7.6 User-defined Packet;
- After all the parameters have been set completely, Click to run the test.

Table 7.6 User-defined Packet

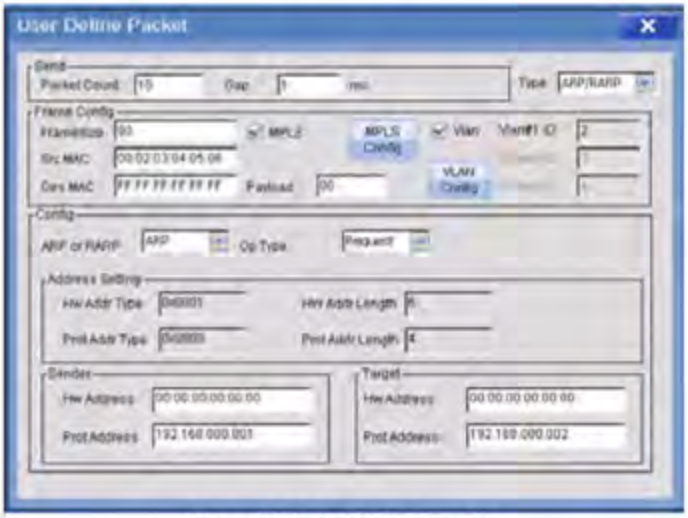
Sub Menu	Parameters
General Description	***User-defined Packet includes 7 types, which are: MAC Packet; ARP/RARP Packet; IP Packet; ICMP Packet; TCP Packet; UDP Packet; and IGMP Packet.***
	Figure 7.43 User-defined Packet
MAC	• Send: • Packet Count: Set the quantity of user-defined packet transmission; • Gap (ms): Set the time interval between the 2 continuous data packets;
	• Type: Select data packet type, support, • MAC; • IP; • TCP; • IGMP; • User Define; • ARP/RARP; • ICMP; • UDP; • Pause;
	• Frame Configuration: • Frame Size: Set size for the data packet, range from 64 to 2048; • Source MAC: Set MAC address for packet source; • Destination MAC: Set MAC address for packet destination; • Payload: Set payload for the user-defined packet, range from 00 to FF;

Sub Menu	Parameters
MAC	• MPLS: Select to enable MPLS header, MPLS label will be added into the packet;
	• MPLS Configuration: Configure MPLS header; ***(Note: This option is ONLY available when MPLS header option has been selected.)*** • MAC Address: • Destination: Set MAC address for destination packet; • Source: Set MAC address for source packet; • VLAN： See Table 7.6 MAC: VLAN Configuration; • MPLS： • Enable: Select the layer of MPLS, 2 layers can be enabled in maximum; • Label: Set MPLS ID, range from 00000 to FFFFF; • EXP: 3 bits, reserved for test, currently, it is used for Cos (Class of Service); • SBit: 1 bit, the location for the last label enters the label stack, • Enable: 1; • Disable: 0; • TTL: Set TTL time; • CtrlW (PW MPLS Control Word): • Type: 0~3 bits, show the type of PW. • Flag: 4~7 bits, set flag values for PW, range from 0 to 15; • FRG: 8~9 bits, set FRG values for PW, range from 0 and 3; • Length: 10~15 bits, show the length of PW; • SeqNum: 16~31 bits, set sequence number, range from 0 to 65535.
	 Figure 7.44 MPLS Configuration Dialogue Box
	• VLAN: Select to enable VLAN label, VLAN Label will be added into the packet;
	• VLAN #1/#2/#3 ID: Display the VLAN ID which has been set in VLAN configuration dialogue box;
	• VLAN Configuration: Configure VLAN parameters; ***(Note: This option is ONLY available when VLAN label option has been selected.)*** • Stack VLAN (Q-in-Q): select VLAN Stack Layer. As many as 3 VLAN stack layers is allowed. You can choose 3 layers of VLAN. • ID: Input VLAN ID, choose values from 1 to 4094; ***(Note: 4095 is retention value, and 0 and 1 are reserved for special purposes.)*** • Priority: Select the priority of VLAN, • 0: 000-Low PRL; • 2: 010-Low PRL; • 4: 100- High PRL; • 6: 110- High PRL; • 1: 001-Low PRL; • 3: 011-Low PRL; • 5: 101- High PRL; • 7: 111- High PRL; • Type: Select type of Ethernet, support, • 8100; • 88A8; • 9100; • 9200; • 9300; • Drop Eligible: Select to drop 'drop eligible' flag. ***(Note: When VLAN types is 8100, 'drop eligible' is NON-available. This option allows Service VLAN Label (S-TAG) to deliver 8 different levels of priority, each priority has one 'drop eligible' flag. If 'drop eligible' has been set in S-TAG, or decoding table of priority indicated PCP value which has been received, has activated 'drop eligible', it means 'drop eligible' has been activated in receiving frames.)***

Test

Sub Menu	Parameters
MAC	 Figure 7.45 VLAN Configuration Dialogue Box  Figure 7.46 MAC Packet

ARP/RARP	• Send: See Table 7.6 MAC: Send;
	• Frame Configuration: See Table 7.6 MAC: Frame Configuration;
	• MPLS Configuration: See Table 7.6 MAC: MPLS Configuration;
	• VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• Configuration:
	  • ARP or RARP: Select protocol type, support,
	  • ARP;
	  • RARP;
	  • Operation Type: Select operation type, support,
	  • Request;
	  • Reply;
	  • Address Setting:
	  • Hw Address Type: Display the type of the Hw address;
	  • Hw Address Length: Display the length of the Hw address;
	  • Protocol Address Type: Display the type of the Prot address;
	  • Protocol Address Length: Display the length of the Prot address;
	  • Sender/Target:
	  • Hw Address: Set the Hw address for sender or target;
	  • Protocol Address: Set the Prot address for sender or target.

Sub Menu	Parameters
ARP/RARP	 Figure 7.47 ARP/RARP Packet

IP	• Send: See Table 7.6 MAC: Send;
	• Frame Configuration: See Table 7.6 MAC: Frame Configuration;
	• MPLS Configuration: See Table 7.6 MAC: MPLS Configuration;
	• VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• IP:
	  • IP Version: Select IP version, support,
	  • IPV4; • IPV6;
	  • IPV4:
	  • TOS: Set TOS value (16 hex);
	  • TTL: Set TTL value, range from 1 to 255;
	  • Src IP: Set source IP;
	  • Dst IP: Set destination IP;
	  • IPV6:
	  • Traffic Class: Set traffic class for IPV6 data stream, it is similar to TOS;
	  • Hop Limit: Set hop limit value for IPV6 data stream, it is similar to TTL;
	  • Src IP: Set source IP;
	  • Dst IP: Set destination IP.

	 Figure 7.48 IP Packet
ICMP	• Send: See Table 7.6 MAC: Send; • Frame Configuration: See Table 7.6 MAC: Frame Configuration;

Test

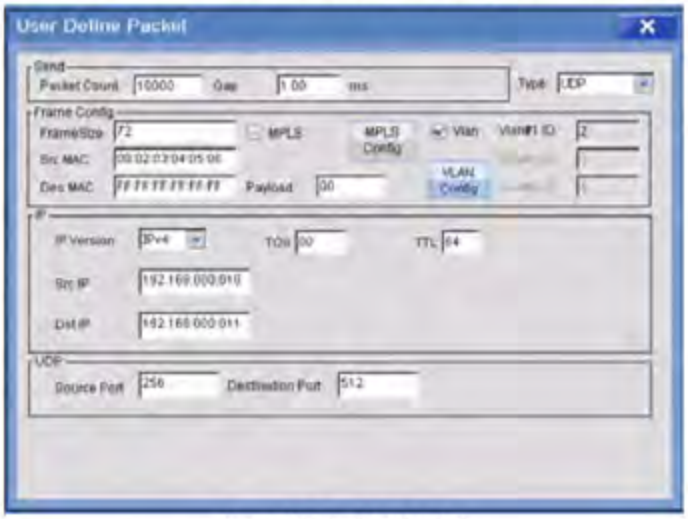
Sub Menu	Parameters

ICMP	• MPLS Configuration: See Table 7.6 MAC: MPLS Configuration;
	• VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• IP: See Table 7.6 IP: IP;
	• ICMP Format:
	  • Type: Select the type of ICMP, support,
	  • Echo request; • Echo reply;
	  • Code: Display the value of Code;
	  • ID: Set value the ID, range from 0 to 65535;
	  • Sequence: Set value for sequence, range from 0 to 65535.
	
	Figure 7.49 ICMP Packet

TCP	• Send: See Table 7.6 MAC: Send;
	• Frame Configuration: See Table 7.6 MAC: Frame Configuration;
	• MPLS Configuration: See Table 7.6 MAC: MPLS Configuration;
	• VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• IP: See Table 7.6 IP: IP;
	• TCP:
	  • Source Port: Set value for source port, range from 0 to 65535;
	  • Destination Port: Set value for destination port, range from 0 to 65535;
	  • Flag bit Field (U, A, P, R, S, F): 6 bits; the field has been selected is 1, otherwise is 0;
	  • URG: Activate urgent pointer;
	  • ACK: Confirm the sequence number whether is available or not;
	  • PSH: The receiver should deliver this message segment to the application layer as soon as possible;
	  • RST: Restart a connection;
	  • SYN: Establish a connection;
	  • FIN: Release a connection.

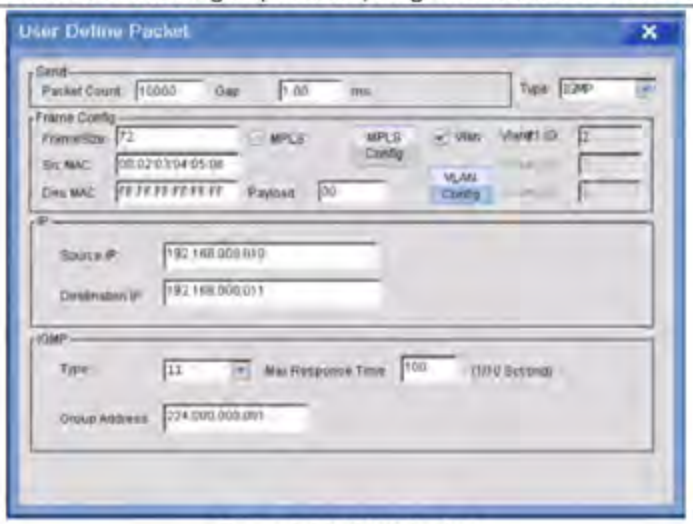
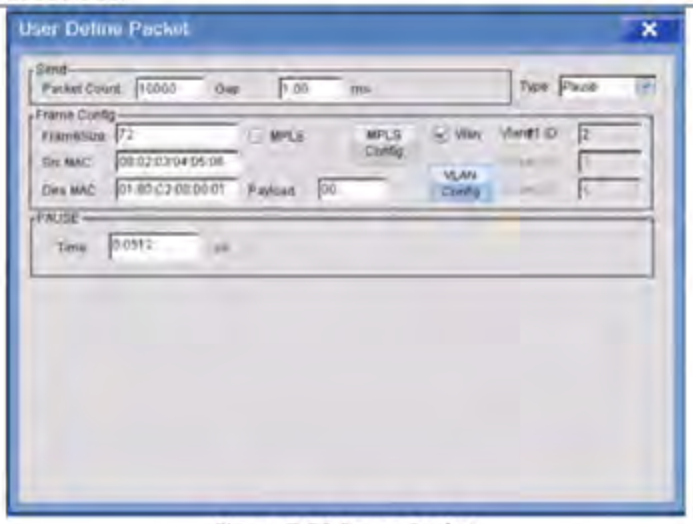
Sub Menu	Parameters
TCP	 Figure 7.50 TCP Packet

UDP	• Send: See Table 7.6 MAC: Send;
	• Frame Configuration: See Table 7.6 MAC: Frame Configuration ;
	• MPLS Configuration: See Table 7.6 MAC: MPLS Configuration;
	• VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• IP: See Table 7.6 IP: IP;
	• UDP:
	  • Source Port: Set value for source port, range from 0 to 65535;
	  • Destination Port: Set value for destination port, range from 0 to 65535.

	 Figure 7.51 UDP Packet

IGMP	• Send: See Table 7.6 MAC: Send;
	• Frame Configuration: See Table 7.6 MAC: Frame Configuration;
	• MPLS Configuration: See Table 7.6 MAC: MPLS Configuration;
	• VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• IP: See Table 7.6 IP: IP;
	• IGMP:
	  • Type: Select type of IGMP,
	  • 11: Membership Inquiry;
	  • 12: Membership Report;
	  • 16: Leave the Group;
	  • 17: Membership Report (IGMPv1);

Test

Sub Menu	Parameters
IGMP	• Max Response Time (0.1s): Set time for max response in the massage inquiry, range from 0 to 255; ***(Note: The default value is 100, which means 10s.)*** • Group Address: Set IGMP group address, range from 0.0.0.0 to 255.255.255.255.
	 Figure 7.52 IGMP Packet
Pause	• Send: See Table 7.6 MAC: Send; • Frame Configuration: See Table 7.6 MAC: Frame Configuration; • MPLS Configuration: See Table 7.6 MAC: MPLS Configuration; • VLAN Configuration: See Table 7.6 MAC: VLAN Configuration; • PAUSE: • Time (us): Set the suspended time for the counterpart, range from 0.512~33553.920.
	 Figure 7.53 Pause Packet
User-defined	• Send: See Table 7.6 MAC: Send; • Frame Configuration: See Table 7.6 MAC: Frame Configuration; • MPLS Configuration: See Table 7.6 MAC: MPLS Configuration; • VLAN Configuration: See Table 7.6 MAC: VLAN Configuration;
	• User-defined Stream: • Data Frame: Display the information of the edited stream; • Number/Letter Key: Set the content of the packet, support, • Number: 1 to 9; • Letter: A to F;

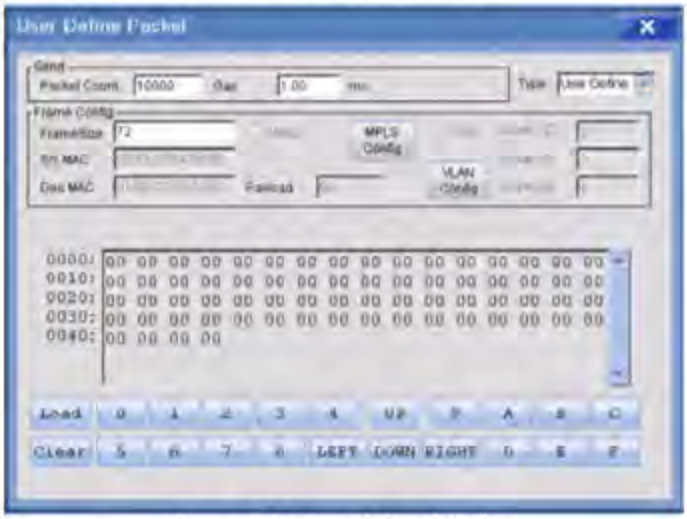
Sub Menu	Parameters
User-defined	• Direction Key: Choose the location in the data frame, support four keys • UP; • DOWN; • RIGHT; • LEFT;
	• Clear: Click to clear the information of packet totally.
	

Figure 7.54 User-defined Packet

7.1.9 Start a Bi-directional Test Case

Start a Bi-directional test case needs to follow the following steps (Use RFC2544 as an example):

- Select 'RFC2544' from configuration box, and enter 'Setting' sub menu from Main menu;
- Select 'RFC2544 Setup' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.4 RFC2544 Setting;
- After all parameters of RFC2544 have been set completely, select 'Bidirectional' from 'Setting' sub menu to configure bi-directional test parameters, the detail instruction for setting bi-directional test is demonstrated in Table 7.7 Bi-directional Test;
- After all the parameters have been set completely, Click to run the test.

Table 7.7 Bi-directional Test

Sub Menu	Parameters
Ourselves Device	• Start Connect Function: Click to enable S Bidirectional Test; • Device Type: Display the type of local device;
	• Local Information: • Auto Broadcast: Select to enable auto broadcast; ***(Note: If the remote device choose 'Auto Broadcast', local device will be scanned.)***

Test

<table>
<tr><th>Sub Menu</th><th>Parameters</th></tr>
<tr><td rowspan="3">Ourselves Device</td><td>• Auto Search: Click to search remote device automatically, the result will be displayed in the message bar;
• Link status: Display the link status of current device,
  • Red: Not connected;
  • Green: Connected;
• Remote IP: Display the IP address of connected remote device currently;
• Connect/ Stop button: Click to establish or stop a connection with remote device.</td></tr>
<tr><td>• Message Bar:
• Device: Show the name or code of the remote device;
• MAC: Show the MAC address information of remote device;
• IP: Show the IP address information of remote device;</td></tr>
<tr><td>• Remote Loopback Control:
(Note: This function is ONLY available when a remote device has been connected.)
• Loopback layer: Select Loopback layer, support,
  • Layer 1; • Layer 2; • Layer 3; • Layer 4;
• Start Button: Click to start remote loopback control function.</td></tr>
<tr><td colspan="2">
Figure 7.55 Bi-directional Test Ourselves Device</td></tr>
<tr><td rowspan="2">Partner Device</td><td>• Remote Information：
• IP Address： Show the IP address of remote device;
• MAC: Show the MAC address of remote device;
• Module： Show the module information of remote device;
• Velocity： Show the velocity of remote device;
• Function: Show specific function which is available of the current remote device;</td></tr>
<tr><td>• Remote Statistic:
• Display the current statistic information: include,
  • Tx Count: Packet sent; • Rx Count: Packet received;
  • Tx Byte Count: Bytes sent; • Rx Byte Count: Bytes received;
• Historical and Current Alarm information Status Display: include,
  • FCS; • IP Checksum; • Jumbo; • Link;
  • Bit Error; • UDP/TCP Error; • Runts;
• Green: No alarm;
• Red: Alarm;
• Seconds: Display time of alarm;
• Counts: Display frequency of alarm.</td></tr>
</table>

Sub Menu	Parameters
Partner Device	

Figure 7.56 Bi-directional Test Partner Device

7.2 Start a Test Case under OTN Application

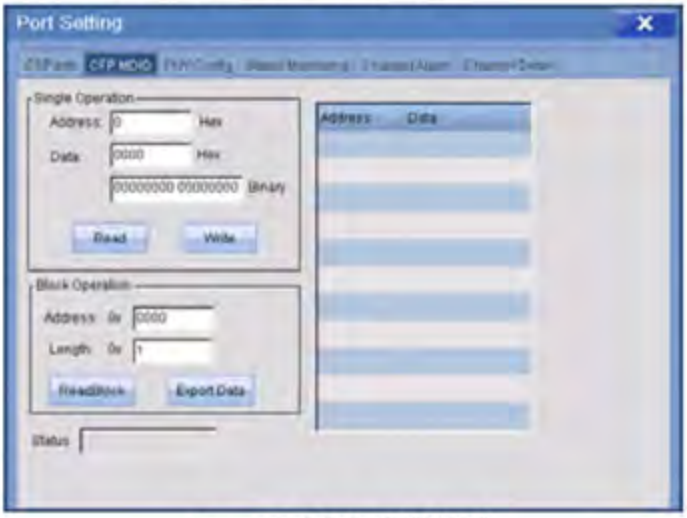
Currently, IVR-100G module only have done the mapping path ONT4. Rest path will be developed gradually.

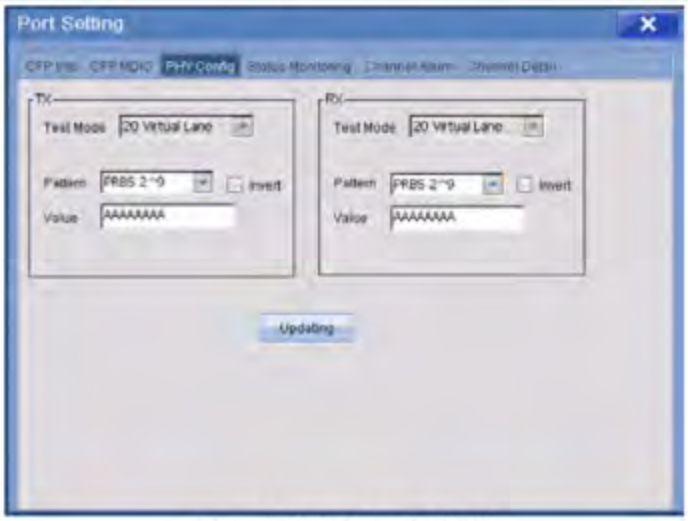
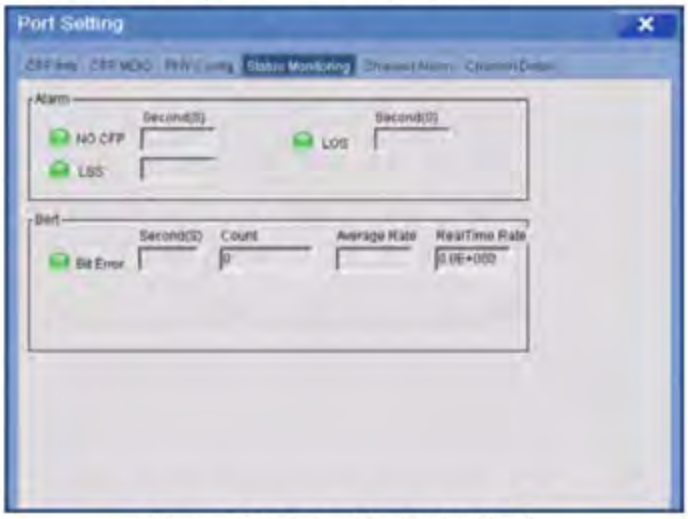
7.2.1 Start an OTN4 Test Case

Start an OTN4 test case needs to follow the following steps:

- Select 'Mapping Setting' from 'Setting' sub menu from Main menu;
- **Or** click the 'Link Box' directly to enter 'Mapping Setting';
- **Or** click button from 'Bottom Ribbon' to enter 'Mapping Setting';
- Select 'Port' from 'Setting' sub menu to configure port parameters, the detail instruction for setting port parameters is demonstrated in Table 7.7 Port Configuration;
- After all parameters of data stream have been set completely, select 'OTN4' from 'Setting' sub menu to configure OTN4 parameters, OTN4 can be set as OTL4, OTU4, ODU4, OPU4. The detail instructions for each is demonstrated in Table 7.8 OTL4 Setting, Table 7.9 OTU4 Setting, Table 7.10 ODU4, and Table 7.11 OPU4.
- After all the parameters have been set completely, Click to run the test.

Table 7.8 Port Configuration

Sub menu	Parameters
CFP Info	• See Table 7.1 PHY Configuration: CFP Info;
	Figure 7.57 CFP Info (***OTN***)
CFP MDIO	• See Table 7.1 PHY Configuration: CFP MDIO;
	
	Figure 7.58 CFP MDIO (***OTN***)
PHY Config	• See Table 7.1 PHY Configuration: PHY Config;

Sub menu	Parameters
PHY Config	 Figure 7.59 PHY Config (***OTN***)
Status Monitoring	• See Table 7.1 PHY Configuration: Alarm/BERT.  Figure 7.60 Status Monitoring (***Port***)
Channel Alarm	• See Table 7.1 PHY Configuration: Channel Alarm; Figure 7.61 Channel Alarm (***OTN***)

Test

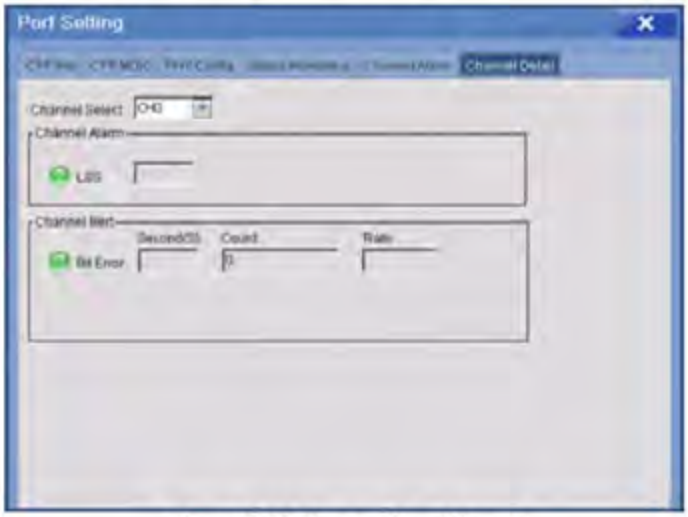
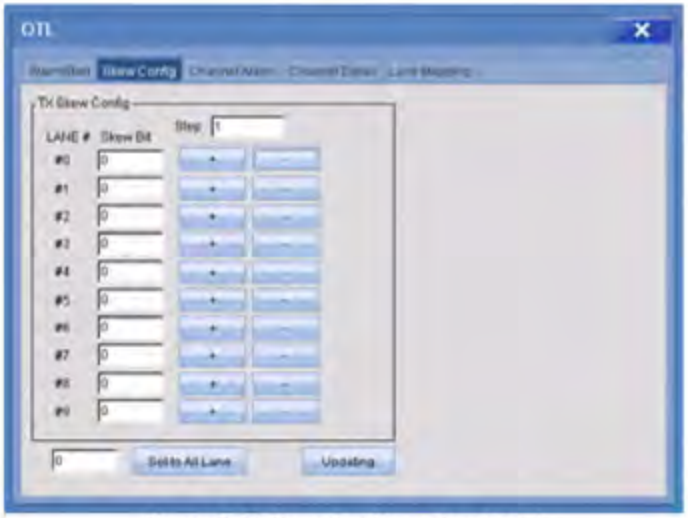
Sub menu	Parameters
Channel Detail	• See Table 7.1 PHY Configuration: Channel Detail.
	

Figure 7.62 Channel Detail (***OTN***)

Table 7.9 OTL4 Setting

Sub menu	Parameters
Alarm/ BERT	• Alarm: Count duration of, • LOFOTL; • LOR; • High Skew; • OOLA; • OOM; • LOLA; • LOM; • OOFOTL; • OOR; • LSS;
	• BERT: Count quantity, duration, and rate of, • FAS; • LLM; • MFSAS; • Bit Error;
Skew Config	• Set skew value for lane 1 to lane 9, or set skew value for all lanes;

Figure 7.63 Alarm/BERT (***OTL4***)

Sub menu	Parameters
Skew Config	 Figure 7.64 Skew Configuration (***OTL4***)
Channel Alarm	• Channel Select: • CH0-CH9; • CH10-CH19;
	• Channel alarm: Display test channel alarm information, include, • Lane#: Actual channel ID; • Lane ID: Logic channel ID; • Alarm: • High Skew; • FAS; • LLM; • MFAS; • LOF; • LOR; • LOM; • LSS; • OOF; • OOR • OOM; • BIT;
	 Figure 7.65 Channel Alarm (***OLT4***)
Channel Detail	• Channel Select: Select channel from CH0-CH19;
	• Channel Alarm: Display duration of alarms: • LOFOTL; • LOM; • OOFOTL; • OOM; • LOR; • High Skew; • OOR; • LSS;
	• Channel BERT: Display BERT information, include duration, count, rate: • FAS; • LLM; • MFAS; • Bit Error;

Test

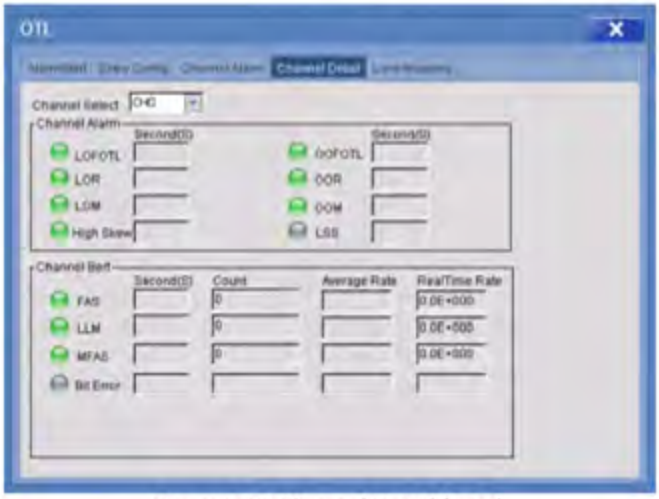
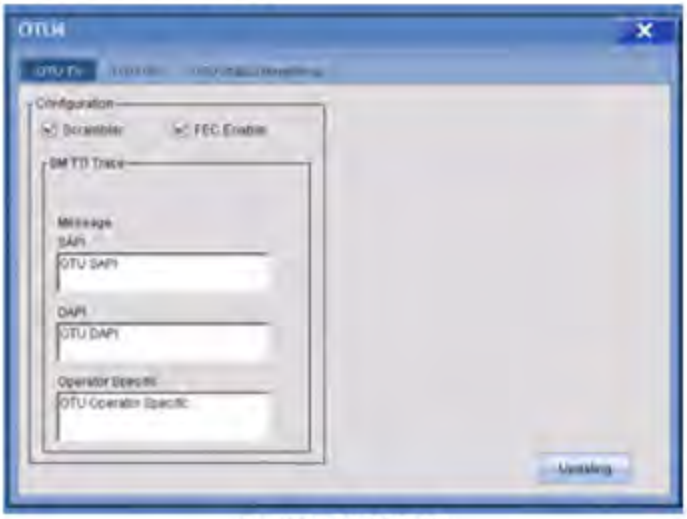
Sub menu	Parameters
Channel Detail	 Figure 7.66 Channel Detail (*OTL4*)
Lane Mapping	• Set logic channel ID for actual channel; Figure 7.67 Lane Mapping (*OTL4*)

Table 7.10 OTU4 Setting

Sub menu	Parameters
OUT TX	• Configuration: • Scrambler: When enable, the transmission signal is scrambled unchecked no transmission signal is scrambled. ***(Note: Default setting is enable scrambling.)*** • FEC Enable: When enable, check transmission signal FEC. ***(Note: Default setting is enable FEC.)***
	• SM TTI trace: • Message: Configure the transmission side TTI value, • SAPI; • DAPI; • Operator Specific; ***(Note: SAPI default is 'OTU SAPI', DAPI default is 'OTU DAPI', Operator Specific default is 'OTU Operator Specific'; After configuration, must click the 'Update Hardware' button to configure the data to be downloaded to the hardware.)***
	 Figure 7.68 OUT TX
OUT RX	• Configuration: • Scrambler: When enable, the transmission signal is scrambled unchecked no transmission signal is scrambled. ***(Note: Default setting is enable scrambling.)*** • FEC Enable: When enable, check transmission signal FEC. ***(Note: Default setting is enable FEC.)*** • FEC Ignored: When enable, check received signal FEC. ***(Note: Default setting is disable FEC ingored.)***
	• SM TTI Trace: • TIM SAPI Enabled: Select to display SAPI alarm; • TIM DAPI Enable: Select to display DAPI alarm; • Received Message: Display messages received, • SAPI; • DAPI; • Operator Specific; • Expected to Receive a Message: Configure the TTI value expected to be received; ***(Note: Same as TX.)***

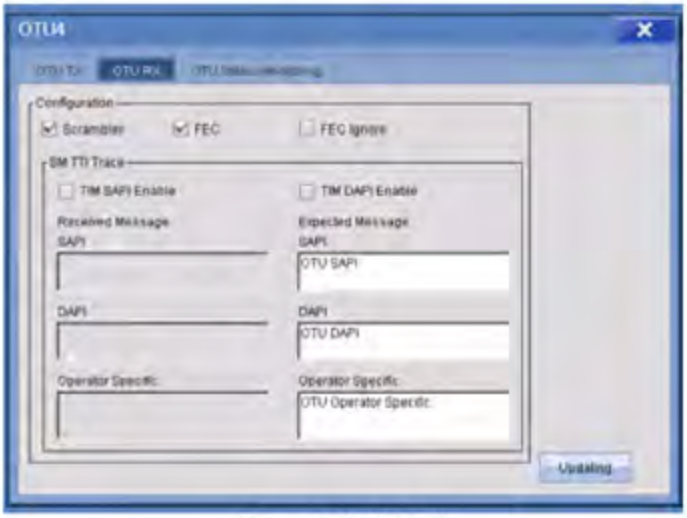
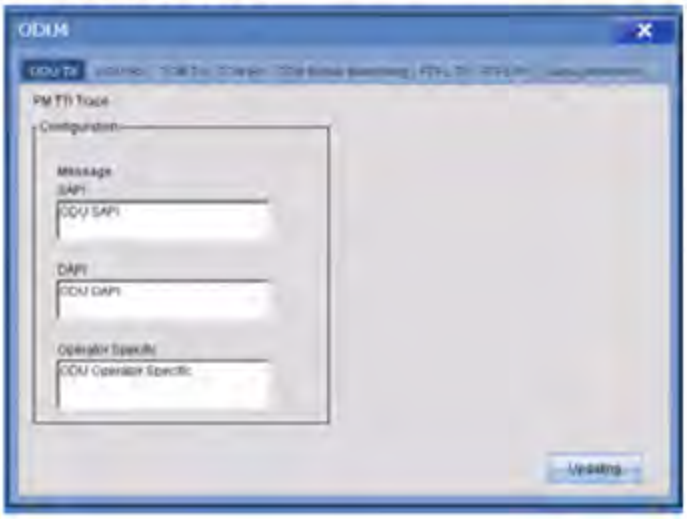
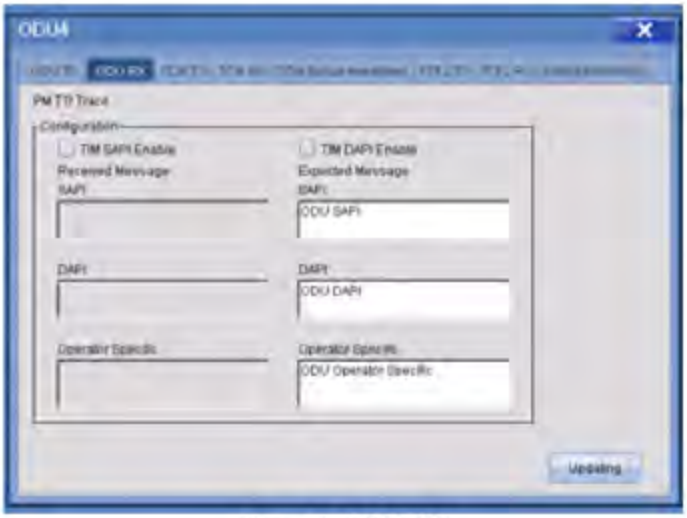
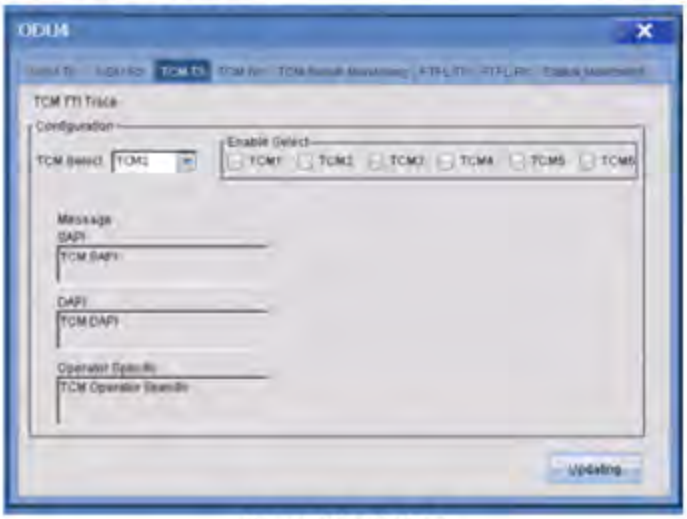
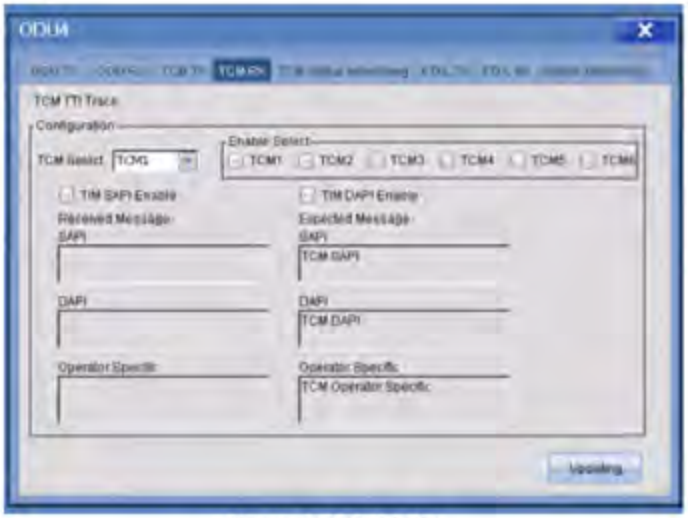
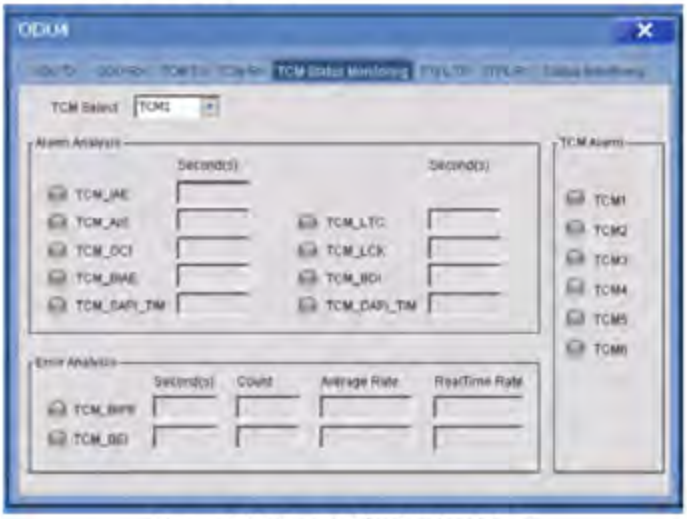
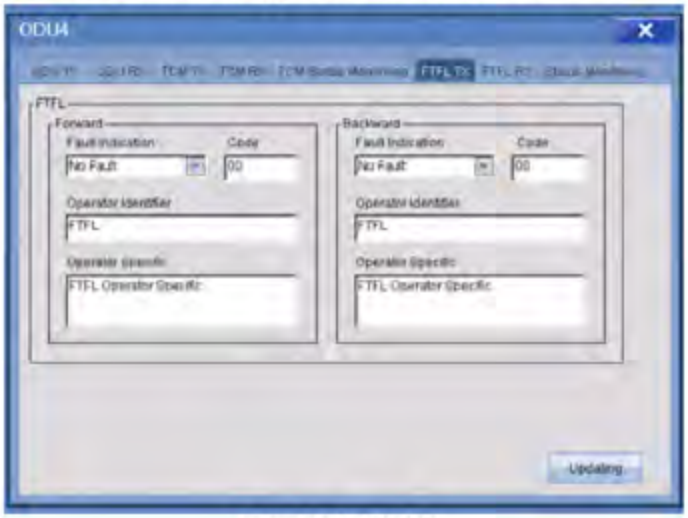
Sub menu	Parameters
OUT RX	 Figure 7.69 OUT RX
Status Monitoring	• Alarm Analysis: Display duration of alarms, • LOF; • AIS; • SAPI_TIM; • OOM; • BDI; • LOM; • IAE; • OOF; • BIAE; • DAPI_TIM; • Error Analysis: Show duration, count, and rates of errors, • FEC_CW; • FEC_BITS; • FAS; • SM_BIP8; • FEC_SYMBOL; • FEC_NOK; • MFAS; • SM_BEI; Figure 7.70 Status Monitoring (*OTU4*)

Table 7.11 ODU4 Setting

Sub menu	Parameters
ODU TX	• PM TTI Trace: • Message: Configure the transmission side TTI value, • SAPI; • DAPI; • Operator Specific; ***(Note: SAPI default is 'ODU SAPI', DAPI default is 'ODU DAPI', Operator Specific default is 'ODU Operator Specific'; After configuration, must click the 'Update Hardware' button to configure the data to be downloaded to the hardware.)***
	 Figure 7.71 ODU TX
ODU RX	• PM TTI Trace: • TIM SAPI Enable: Select to display PM_SAPI_TIM alarm; • TIM DAPI Enable: Select to display PM_DAPI_TIM alarm; • Received Message: Display messages received, • SAPI; • DAPI; • Operator Specific; • Expected to Receive a Message: Configure the TTI value expected to be received; ***(Note: Same as TX.)***
	 Figure 7.72 ODU RX
TCM TX	• TCM TTI Trace: • TCM Selection: Select TCM signals from 1 to 6; • Transmit Enable: Enable TCM TTI Trace from 1 to 6; • Message: Configure the transmission side TTI value, • SAPI; • DAPI; • Operator Specific;

Test

Sub menu	Parameters
TCM TX	***(Note: SAPI default is 'TCM SAPI', DAPI default is 'TCM DAPI', Operator Specific default is 'TCM Operator Specific'; After configuration, must click the 'Update Hardware' button to configure the data to be downloaded to the hardware.)***
	 Figure 7.73 TCM TX
TCM RX	• TCM TTI trace Configuration: • TCM Selection: Select TCM signals from 1 to 6; • Receive enable: Enable TCM TTI Trace from 1 to 6; • TIM SAPI Enable: Select to display TCM SAPI TIM alarm; • TIM DAPI Enable: Select to display TCM_DAPI_TIM alarm; • Received Message: Display messages received, • SAPI; • DAPI; • Operator Specific; • Expected to Receive a Message: Configure the TTI value expected to be received; ***(Note: Same as TX.)***
	 Figure 7.74 TCM RX
TCM Status Monitoring	• TCM Selection: Select TCM signals from 1 to 6;
	• Alarm Analysis: Show the duration of alarms, • TCM_IAE; • TCM_BIAE; • TCM_LCK; • TCM_AIS; • TCM_SAPI_TIM; • TCM_BDI; • TM_OCI; • TCM_LTC; • TCM_DAPI_TIM;
	• Error Analysis: Show the duration, count, and rate of, • TCM_BIP8; • TCM_BEI;

Sub menu	Parameters
TCM Status Monitoring	• TCM Alarm: Show 1 to 6 TCM alarm;
	 Figure 7.75 Status Monitoring (***TCM***)
FTFL TX	• Forward/Backward FTFL: • Fault Indication: Select to generate FTFL fault indication message, • No fault; • Signal failure; • Signal reduction; • Reserved; • Code: Set the code for the fault indication message, • No fault: 00; • Signal reduction: 02; • Signal failure: 01; • Reserved: 03; • Operator Identifier: Set Identifier by user; • Operator Specific: Set Operator Specific by user; ***(Note: Default setting is 'FTFL'. Default setting is 'FTFL Operator Specific'. After configuration, must click the 'Update Hardware' button to configure the data to be downloaded to the hardware.)***
	 Figure 7.76 FTFL TX
FTFL RX	• Same as TX;

Test

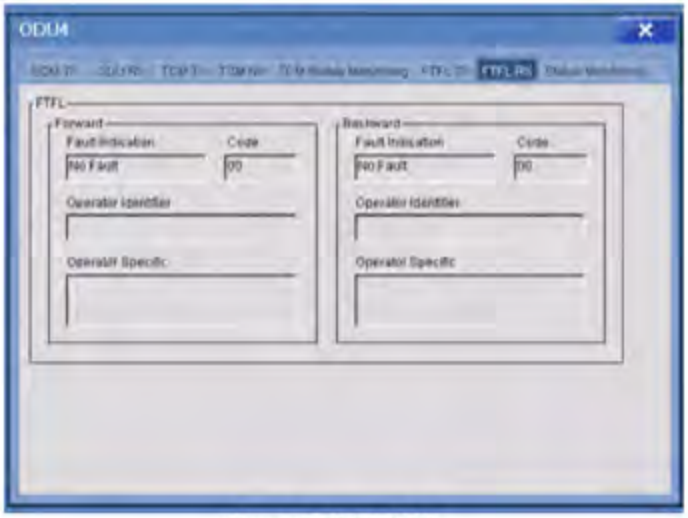
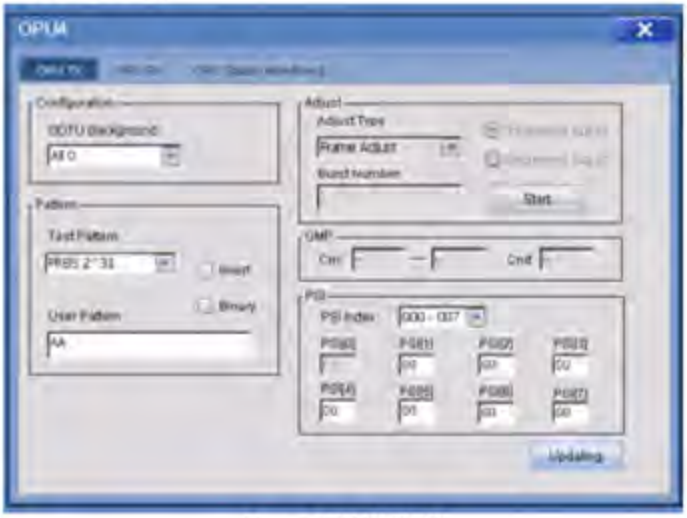
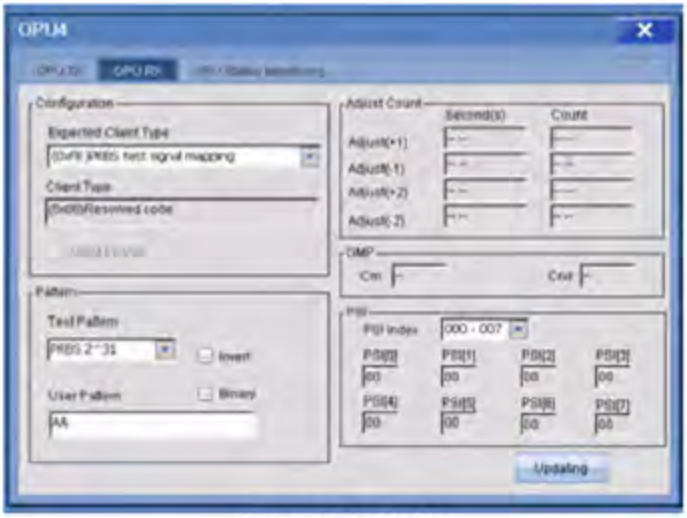
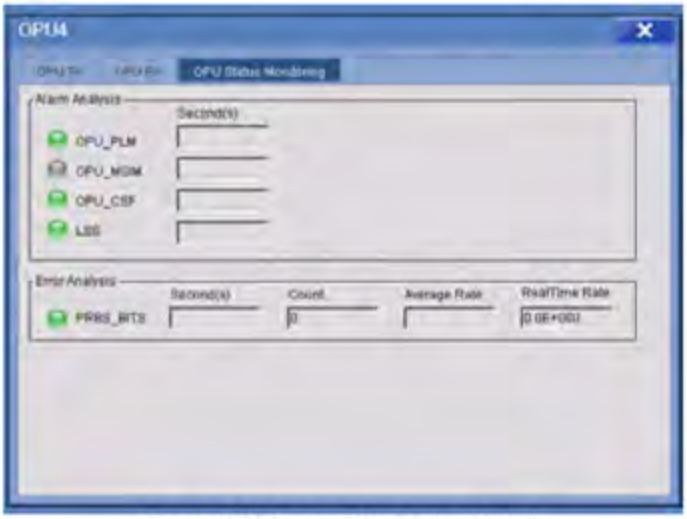
Sub menu	Parameters
FTFL RX	 Figure 7.77 FTFL RX
Status Monitoring	• Alarm Analysis: Display duration of alarms: • LOFLOM; • ODU_FSD; • LOFOOM; • ODU_FSF; • PM_OCI; • ODU_BSD; • PM_BDI; • ODU_BSF; • PM_AIS; • PM_SAPI_TIM; • PM_LCK; • PM_DAPI_TIM; • Show the duration, count, and rate of, • TCM_BIP8; • TCM_BEI. Figure 7.78 Status Monitoring (***ODU4***)

Table 7.12 OPU4 Setting

Sub menu	Parameters
OPU TX	• Configuration: • ODTU Background: Select background stream format, • All 0; • All 1; • Patterns: Available, • PRBS2-7; • PRBS2-11; • PRBS2-20; • PRBS2-23; • PRBS2-9; • PRBS2-15; • PRBS2-31; • User-defined; • Invert: Enable this option, all value in the pattern will be reversed, 1 to 0, 0 to 1; • Binary: Enable binary;

Sub menu	Parameters
OPU TX	• Value: Set pattern value by user, default HEX;
	• Adjust: • Adjust Type: Support, • Frame; • Alternate; • Burst Number: Sets the number of adjust frames; • Adjustment Options: Support • +1; • -1; • Start button: Click to start;
	• GMP: • Cm: Displays the m-bit value of the client data entity; • Cnd: Displays the difference between Cn and (m / n x Cm), Cn is the n-bit value of the client data entity; • PSI: PSI [2] ~ PSI [9]: The PSI (Payload Structure Identifier) overhead byte is only applicable to OPU2 with ODU multiplexing, Can be configured a value between 00 and FF in hexadecimal. ***(Note: After configuration, must click the 'Update Hardware' button to configure the data to be downloaded to the hardware.)***
	 Figure 7.79 OPU TX
OPU RX	• Configuration: • Expected Client Type: Support, • PT: 20; • PRBS; • Syn CBR; • Ethernet; • PT: 21; • NULL; • Asyn CBR; • Client Type: Displays the actual received signal payload type; • MSIM Enable: Select to display Multiplex Structure ID Mismatch Alarm;
	• Pattern: See TX;
	• Adjust: Display the statistics for positive 1, negative 1, positive 2, and negative 2 adjustments; • Time (s): Display the adjustment time in s. • Number: Display the number of adjustment frames;
	• GMP: See TX;

Test

Sub menu	Parameters
OPU RX	 Figure 7.80 OPU RX
Status Monitoring	• Alarm Analysis: Display duration of alarms: • OPU_PLM; • OPU_MSIM; • OPU_CSF; • LSS; • Show the duration, count, and rate of, • PRBS_BITS.  Figure 7.81 Status Monitoring (***OPU4***)

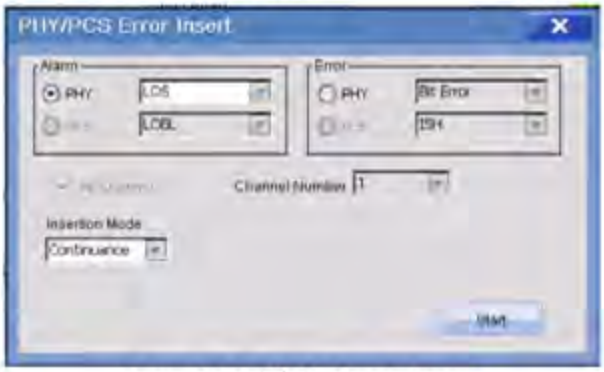
8. Advanced Test Function

Advanced test function are all under 100G Ethernet Application.

8.1 PHY/PCS Error Injection

Instruction of PHY/PCS error is ONLY available under PHY/PCS test. Instruction of PHY/PCS test have been demonstrated in Section 7.1.1 Start a PHY Test Case and Section 7.1.2 Start a PCS Test Case.

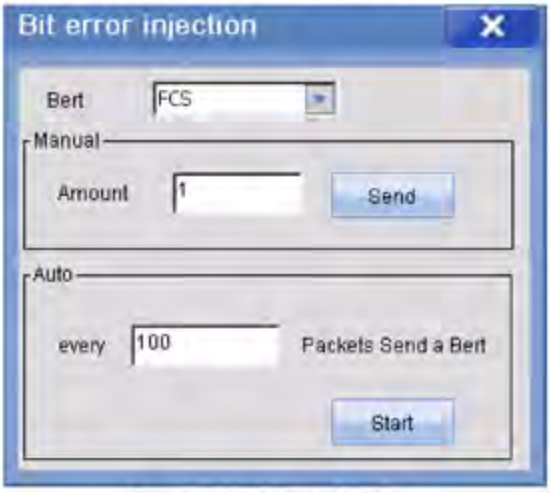
Table 8.1 PHY/PCS Error Injection

Sub Menu	Parameters
PHY/PCS Error Injection	• Alarm (PHY): Select PHY insert error alarm types, support, • LOS; • LSS;
	• Alarm (PCS): Select PCS insert error alarm types, support, • LOBL; • LOAML; • HBER; • LSS;
	• Error (PHY): Select PHY insert error types, support, • Bit Error;
	• Error (PCS): Select PCS insert error types, support, • ISH; • IAM; • BIP8 Bit; • BIP8 Err; • Bit Error.
	• ALL Channel: Select to insert errors into all channels;
	• Channel Number: Select to insert errors into one particular channel;
	• Insertion Mode: Select insert mode, support, • Singe; • Continuance; • Burst; • Rate; • Alternative; • Framing.
	 Figure 8.1 PHY/PCS Error Injection

8.2 Ethernet Bit Error Injection

Instruction of bit error injection has been demonstrated in Section 7.1.5 Start a Bit Error Test Case. Bit error injection is ONLY available under BERT test.

Table 8.2 Bit Error Injection

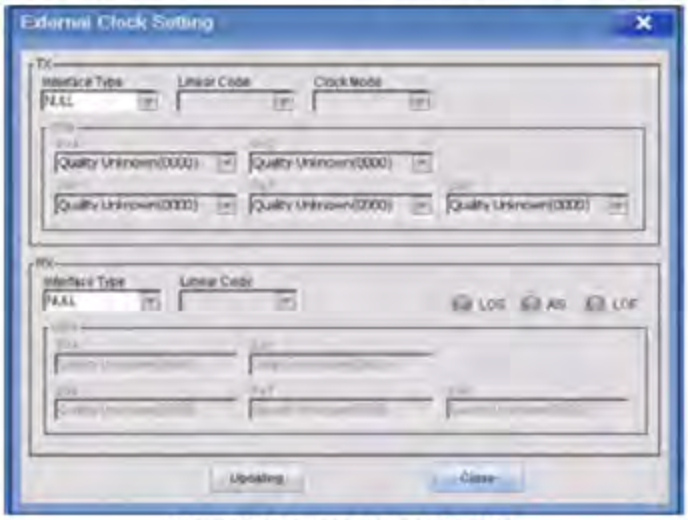
Sub Menu	Parameters
Bit Error Injection	• Bert Type: Select bit error injection types, support, • Bit Error; • UDP/TCP; • FCS; • OOS;
	• Manual: • Amount: Set quantity for inserting bit error, range from 1 to 16000000, ***(Note: The default value is 1.)*** • Send Button: Click to inject bit error manually;
	• Auto: • Every: Set interval of bit error insertion, range from 1 to 16000000; ***(Note: The default value is 1.)*** • Start Button: Click to insert bit error automatically.
	 Figure 8.2 Bit Error Injection

8.3 External Clock

Set External Clock needs to follow the following step:

- Select 'External Clock' from 'Setting' sub menu to set RX external clock. Detail instruction has been demonstrated in Table 8.3 External Clock.

Table 8.3 External Clock

Sub Menu	Parameters
External Clock	• Interface Type: Select types of received clock, support, • NULL; • E1; • DS1; • 2MHz;
	• Line Coding: Select types of the interface line coding, support, • For DS1: B8ZS; • For E1: HDB3; • For 2MHz: NON-available;
	• Alarm: include, • LOS; • AIS; • LOF;
	• SSM: Set Sa4, Sa5, Sa6, Sa7 and Sa8 values, ***(Note: This option is ONLY available when the interface type is E1.)*** • 0000: Quality unknown; • 1000: SSU-B; • 0001: Reserved; • 1001: Reserved; • 0010: ITU G.811; • 1010: Reserved; • 0011: Reserved; • 1011: ITU-T G.813 Option; • 0100: SSU-A; • 1100: Reserved; • 0101: Reserved; • 1101: Reserved; • 0110: Reserved; • 1110: Reserved; • 0111 Reserved; • 1111: Do not use for synchronization;
	 Figure 8.3 External Clock Setting

(Note: 'Updating' button needs to be clicked after the configuration has been done, which is in order to download the configuration into the hardware.)

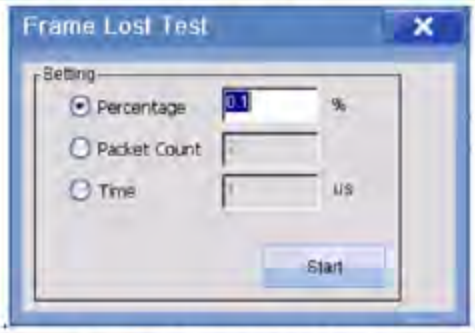
8.4 Frame Loss Test

Set Frame Loss Test needs to follow the following steps:

- Select 'Frame Lost Test' from 'Setting' sub menu to set frame loss test. Detail instruction has been demonstrated in Table 8.4 Frame Loss Test.

(Note: Frame Loss Test is ONLY available when loopback test has been started.)

Table 8.4 Frame Loss Test

Sub Menu	Parameters
Frame Loss Test	• Percentage: Set frame loss ratio, range from 0.1%~99.9%; • Packet Count: Set quantity of frame loss packet; • Time: Set frame loss time; • Start Button: Click to start frame loss test.  Figure 8.4 Frame Lost Test

8.5 Loopback Setting

Set Loopback needs to follow the flowing steps:

- Select 'Loop set' from 'Setting' sub menu to set loopback. Detail instruction has been demonstrated in Table 8.5 Loopback Setting.

(Note: Loopback/Throughout setting is ONLY available under loopback test.)

Table 8.5 Loopback Setting

Sub Menu	Parameters
Loopback Setting	• Loop Drop Enable: Select loop filter to filter information, support, • Control Loss; • Other Packet Loss; • Filtered Loss. Figure 8.5 Loop Set

9. Tool

9.1 Ping Setup

Set Ping Setup needs to follow the following step:

- Select 'Ping Setup' from 'Tool' sub menu to set ping. Detail instruction has been demonstrated in Table 9.1 Ping Setup.

Table 9.1 Ping Setup

Sub Menu	Parameters

Ping Setup	• Port Selection: Select the test port, support,
	  • Port (in the Ethernet Teat module);
	  • Host port (located on the right side of the test platform);

	• Ping Setup:
	  • Report: Click to generate a test report;
	  • Destination Address: Set IP address for destination;
	  • Destination Address Ping button: Click to ping destination IP address;
	  • URL: Set destination URL;
	  • URL Ping Button: Click to ping destination URL;
	  • Packet Size: Set the size for ping packet;
	  • Packet Count: Set quantity of ping packet for transmission;
	  • TTL: Set live time for ping packet;
	  • Interval: Show interval time between two packets;
	  • Clear Button: Click to clear textbox;
	  • Textbox: Show the ping result.

	 Figure 9.1 Ping Setup

9.2 Trace Route

Set Trace Route needs to follow the following step:

- Select 'Trace Route' from 'Tool' sub menu to set trace route. Detail instruction has been demonstrated in Table 9.2 Trace Route.

Table 9.2 Trace Route

Sub Menu	Parameters

Trace Route	• Port Selection: Select the test port, support,
	  • Port (in the Ethernet Teat module);
	  • Host port (located on the right side of the test platform);

	• Trace Route Setup:
	  • Destination Address: Set IP address for destination;
	  • Start Button: Click to start to trace destination IP address;
	  • URL: Set destination URL;
	  • URL Start Button: Click to start to trace destination URL address;
	  • Textbox: Show the result of trace route.

	 Figure 9.2 Trace Route

9.3 Flow Control

Set Flow Control needs to follow the following step:

- Select 'Flow Control' from 'Tool' sub menu to set flow control. Detail instruction has been demonstrated in Table 9.3 Flow Control.

Table 9.3 Flow Control

Sub Menu	Parameters
Flow Control	• Insert Stoppage Time Quantity: • Packet Stoppage Time: Set suspended time for packet transmission; • Unit: us; • Send Button: Click to insert suspended time during packet transmission; • Flow Control RX: Click to enable RX flow control;
	• Statistics: • Pause Time: Count the suspended time of the received flow control frame, include, • Total; • Last; • Maximum; • Minimum; • Unit: us; • Pause Frame Count: Count suspended frames of sending and received, include, • TX; • Rx.
	 Figure 9.3 Flow Control

9.4 FTP

Set FTP needs to follow the following step:

- Select 'FTP' from 'Tool' sub menu to set FTP. Detail instruction has been demonstrated in Table 9.4 FTP.

(Note: The device needs to be connected with internet by Ethernet port, which is on the right side of the device, in order to activate FTP function.)

Table 9.4 FTP

Sub Menu	Parameters
FTP	• Host: Input the server IP address; • User: Input FTP User name; • Pass: Set FTP password; • Upload/Download Message Box: Display information which has been uploaded or downloaded; • Status: Display the current FTP status; • Remote Site: Display the file information of remote FTP site, include, • File name; • File size (byte); • Connect Button: Click to connect the FTP site; • Download button: Click to download the files from FTP; • Upload Button: Click to upload local files to FTP; • D_Rate Test: Click to test download speed and display in the information bar; • Upload Speed Test: Click to test upload speed and display in the information bar; • Pause: Click to stop file upload/download. Figure 9.4 FTP

9.5 HTTP

Set HTTP needs to follow the following step:

- Select 'HTTP' from 'Tool' sub menu to set HTTP. Detail instruction has been demonstrated in Table 9.5 HTTP.

(Note: The device needs to be connected with internet by Ethernet port, which is on the right side of the device, in order to activate HTTP function.)

Table 9.5 HTTP

Sub Menu	Parameters
HTTP	• HTTP Address: Input HTTP address for test; • Count: Set times for HTTP test; • Start Button: Click to start or stop HTTP test; • Status: Display test status of the connected HTTP; • Result: Display test result of connected HTTP; • Test Information Box: Display test Information of the connected HTTP; • Strat Web Browser Button: Click to open the web of HTTP address. Figure 9.5 HTTP

9.6 Online Service Scan

Set Online Service Scan needs to follow the following step:

- Select 'Online Service Scan' from 'Tool' sub menu to set online service scan. Detail instruction has been demonstrated in Table 9.6 Online Service Scan.

Table 9.6 Online Service Scan

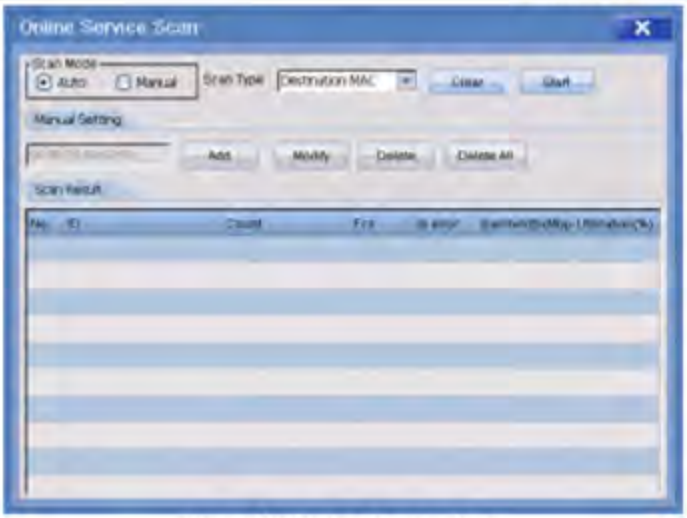
Sub Menu	Parameters
Online Service Scan	• Scan Mode: Support, • Manual; • Auto;
	• Scan Type: Support, • Destination MAC; • Source MAC; • VLAN Id; • Vlan2 Id; • MPLS Label; • MPLS2 Label;
	• Clear: Click to clear data;
	• Start: Click to start online scan;
	• Manual Setting: • Address Box: Set address information manually; • Add: Click to the address information after the information has been inputted in address box; • Modify: Click to modify the address information which has been selected; • Delete: Click to delete the address information which has been selected; • Delete all: click to delete all address information;
	• Scan Result: Display the result information, include, • No.; • ID; • Count; • Fcs; • IP error; • Bandwidth; • Utilisation;
	

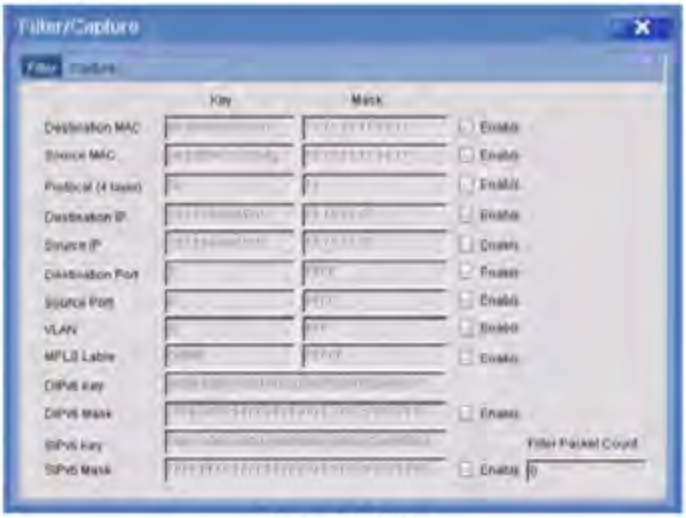
Figure 9.6 Online Service Scan

9.7 Filter/Capture

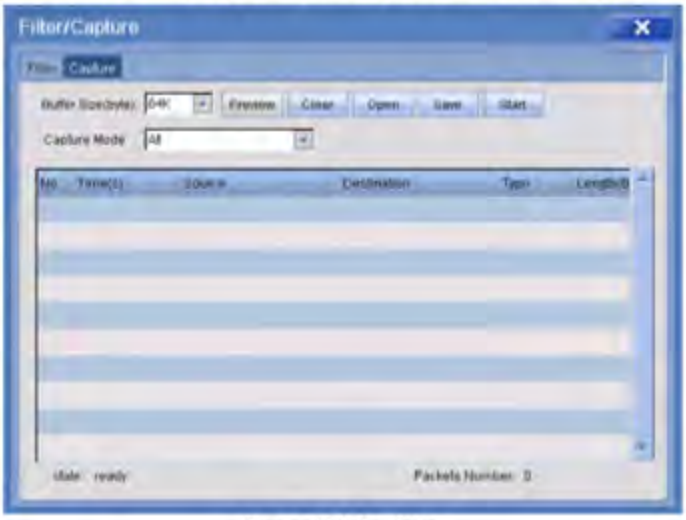
Set Filter/Capture needs to follow the following step:

- Select 'Filter or Capture' from 'Tool' sub menu to set filter or capture. Detail instruction has been demonstrated in Table 9.7 Filter/Capture.

Table 9.7 Filter/Capture

Sub Menu	Parameters
Filter	• Filter: Include, • Destination MAC; • Source MAC; • Protocol (4 layer); • Destination IP; • Source IP; • Destination Port; • Source Port; • VLAN; • MPLS Label; • D_IPv6 Key; • D_IPv6 Mask; • S_Ipv6 Key; • S_IPv6 Mask.
	• Enable: Click to enable this filter;
	• Filter Packet Count： Show the actual quantity of the packets have been filtered.
	 Figure 9.7 Filter
Capture	• Buffer Size (byte): Select the buffer size for storing capture data, support, • 16K; • 64K; • 1M; • 8M; • 16M; • 32M; • 48M;
	• Capture Mode: Select capture mode, support, • All; • Filter; • FCS OK; • FCS Error; • IP Check Error; • UDP/TCP Check Error; • UDP/TCP/IP Check Error;
	• Preview Button: Click to preview the packet information which has been captured;
	• Clear Button: Click to clear packet information which has been captured;

Tool

Sub Menu	Parameters
Capture	• Open Button: Click to open the packet which has been captured;
	• Save Button: Click to save packet information which has been captured;
	• Start/Stop Button: Click to start or stop to capture packet;
	• Capture Information Box: Display information of packet has been captured, include, • No.; • Time (s); • Source; • Destination; • Type; • Length (Byte);
	• Status: Display the status of packet capture;
	• Packets Number: Display the quantity of the captured packets.
	 Figure 9.8 Capture

9.8 Setting

Set Test Duration and Alarm Bell need to follow the following step:

- Select 'Setting' from 'Test' sub menu to set test duration and alarm bell. Detail instruction has been demonstrated in Table 9.8 Setting.

Table 9.8 Setting

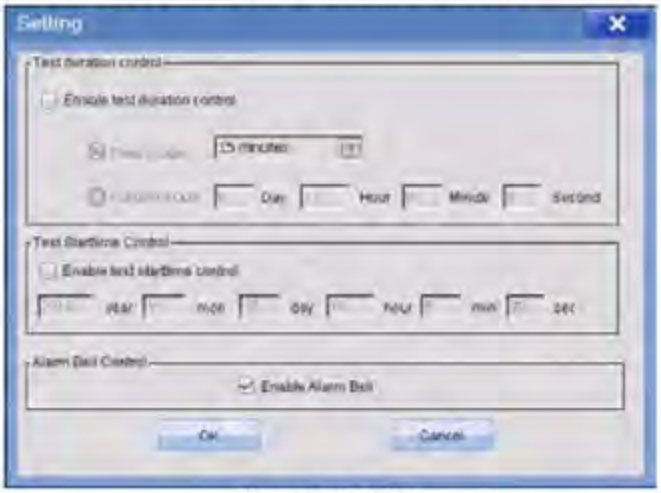
Sub Menu	Parameters
Setting	• Test Duration Control: • Enable Test Duration Control: Click to enable test duration control; • Fixed Mode: Select the fixed test duration mode, support, • 15 m; • 24h; • 3d; • User-defined Mode: Select user-defined mode to set the test end time, support, • Day; • Hour; • Minute; • Second;
	• Test Start time Control: • Enable Test Start Time Control: Click to enable test start time control; • Time Setting: Set test start time, support, • Year; • Day; • Minute; • Month; • Hour; • Second;
	• Alarm Bell Control: • Enable Alarm Bell Control: Click to enable alarm bell.
	

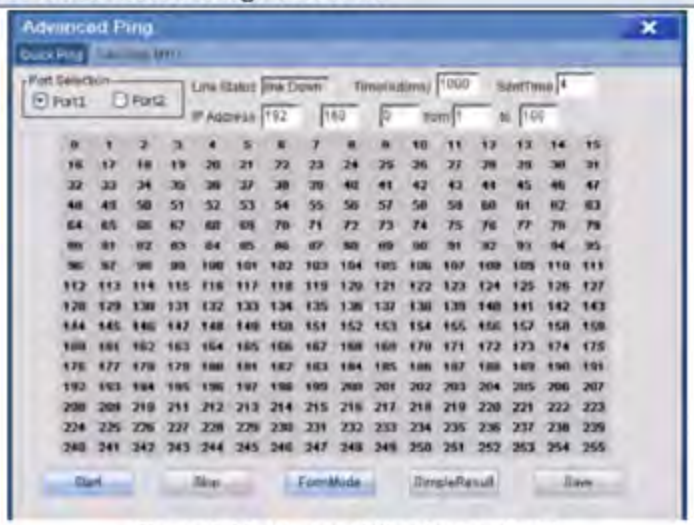
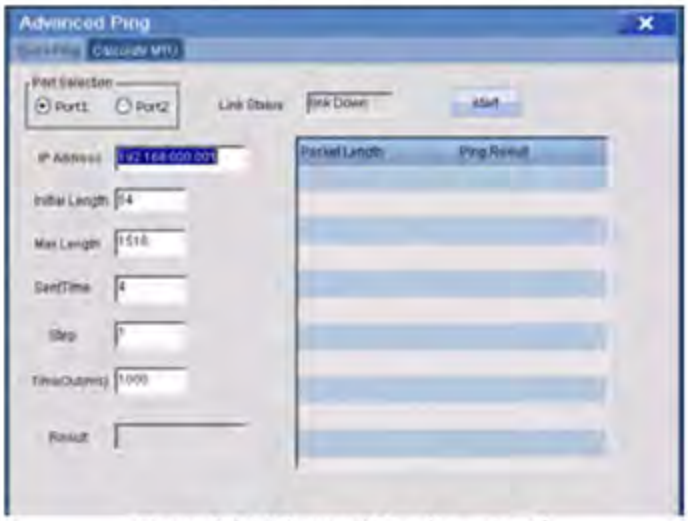
Figure 9.9 Setting

9.9 Advance Ping

Set Advanced Ping needs to follow the following step:

- Select 'Advance Ping' from 'Tool' sub menu to set ping. Detail instruction has been demonstrated in Table 9.9 Advanced Ping.

Table 9.9 Advanced Ping

Sub Menu	Parameters
Quick Ping	• Port Selection: Select the test port, support, • Port 1 or Port 2 (in the Ethernet Teat module); • Link Status: Show the Link Status; • Time Out: Set the value for time out; • Sent Time: Set the value for repeating ping; • IP Address: Set network segment of IP.  Figure 9.10 Advanced Ping (***Graph Mode***)  Figure 9.11 Advanced Ping (***Form Mode***)

9.10 Advance Loopback

Click to enable CAUI Local Loopback function.

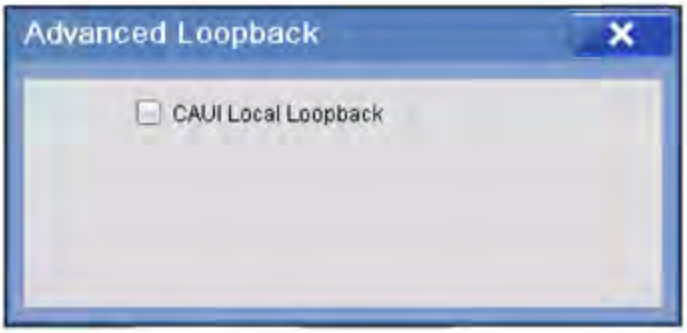


Figure 9.12 Advance Loopback

10. Result

Result show is under 100G Ethernet Application.

10.1 Result Overview

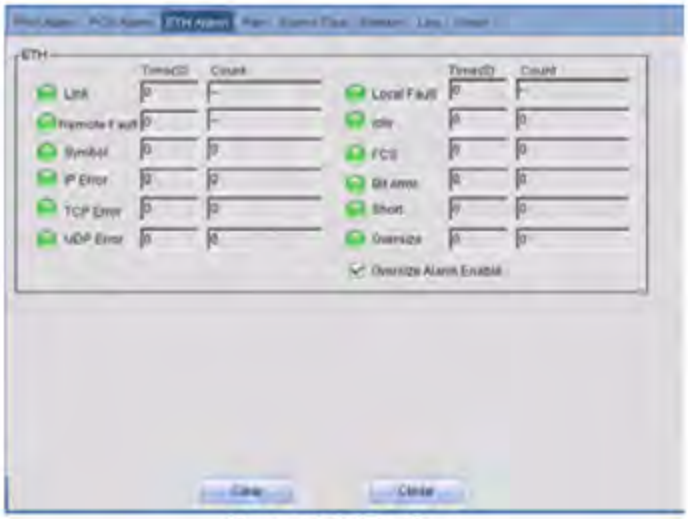
View result overview needs to follow the following step:

- Select 'Overview' from 'Result' sub menu to view result overview. Result overview include 9 parts, which are: PHY Alarm; PCS Alarm; Eth Alarm; Port; Frame Type; Stream; Log; Graph.

Table 10.1 Result Overview

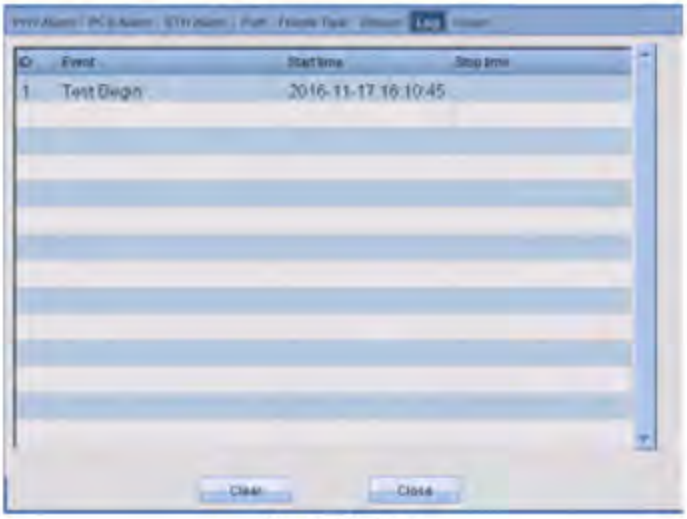
Sub Menu	Parameters
PHY Alarm	• Alarm: Show the duration of, • NO CFP; • LOS; • LSS;
	• BERT: Show the duration, count, and rate of error, • Bit Error;
PCS Alarm	• Alarm: Count duration of, • LOBL; • High Skew; • HBER; • LOA; • LOAML; • LSS;
	• BERT: Count quantity, duration, and rate of, • ISH; • BIP8 Err; • Bit Error; • IAM; • BIP8 Bit;

Figure 10.1 PHY Alarm

Sub Menu	Parameters
PCS Alarm	Figure 10.2 PCS Alarm
ETH Alarm	• ETH: Show the duration and count of alarm/error relevant to other Ethernet test, include, • Link; • TCP Error; • FCS; • Symbol; • UDP Error; • Bit Error; • Remote Fault; • Local Falut; • Short; • IP Error; • Idle; • Oversize;  Figure 10.3 ETH Alarm
Port	• Frame Size (Effective): • Count: Show the size of each received frame (valid and invalid); • Percentage (%): Show the percentage of each received frame size; • < 64: Frame size less than 64 bytes; • 64 – 127: Frame size from 64 to 127 bytes; • 128 – 255: Frame size from 128 to 255 bytes; • 256 – 511: Frame size from 256 to 511 bytes; • 512 – 1023: Frame size from512 to 1023 bytes; • 1024 – 1279: Frame size from 1024 to 1279 bytes; • 1280 – 1518: Frame size from 1280 to 1518 bytes; • > 1518: Frame size more than 1518 bytes;

Result

<table>
<tr><th>Sub Menu</th><th>Parameters</th></tr>
<tr><td rowspan="3">Port</td><td>• Valid Frame Counts:
• Broadcast: Show the quantity of broadcast frames transmitted/received without any FCS errors.
(Note: Broadcast frames have the FF-FF-FF-FF-FF-FF MAC address.)
• Multi-cast: Show the quantity of multi-cast frames transmitted/received without any FCS errors;
• Total: Show the quantity of frames transmitted/received without any FCS errors;</td></tr>
<tr><td>• Throughput:
• Utilisation (%): Display the percentage of line rate utilization;
• Bandwidth (Mbps): Display the receiving data rate;
• Frame Rate (fps): Display the quantity of frames have been received per second.</td></tr>
<tr><td>
Figure 10.4 Port</td></tr>
<tr><td rowspan="3">Frame Type</td><td>• Frame Type Statistics: Count data packet types, include,
• Test; • Non-test; • MAC; • IP; • IPv6; • TCP; • UDP; • VLAN; • MPLS1; • MPLS2; • MPLS3; • Pause;</td></tr>
<tr><td>
Figure 10.5 Frame Type</td></tr>
<tr><td rowspan="2">Stream</td><td>• Stream: Select the number of the stream;</td></tr>
<tr><td>• Stream Statistics: Allow to count stream, include,</td></tr>
</table>

Sub Menu	Parameters
Stream	• TX Frame Count; • RX Frame Count; • Byte Count; • FCS; • Bit Error; • IP Check Error; • TCP Check Error; • UDP Check Error; • OOS; • Min Delay; • Max Delay; • Average Delay; • Min Jitter; • Max Jitter; • Acc Jitter; • Average Jitter; • Lost Count; • Lost Ratio; Figure 10.6 Stream
Log	• Event List: • ID: Show the event number sequentially; • Event: Show the alarm/BERT of the test; • Start time: Show the event starting time; • Stop time: Show the event end time.  Figure 10.7 Log
Graph	• Graph: Display test results, include, • Utilisation ratio; • Bandwidth;

Result

Sub Menu	Parameters
Graph	

Figure 10.8 Graph

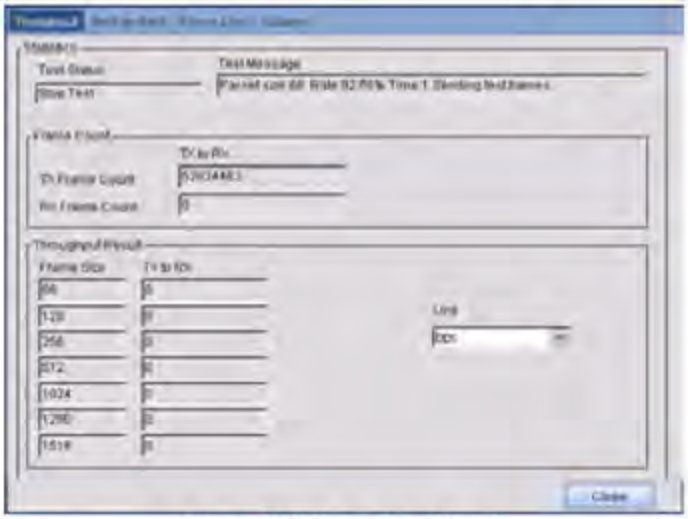
10.2 RFC2544 Results

View RFC2544 test result needs to follow the following step:

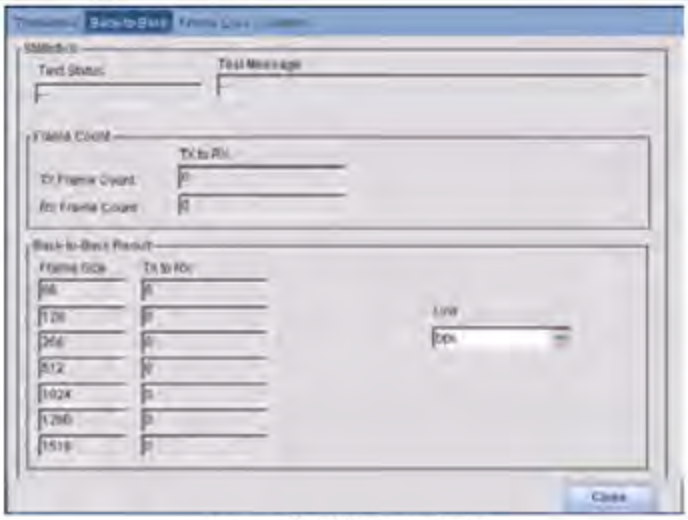
- Select 'RFC2544 Results' from 'Result' sub menu to view RFC2544 test result.

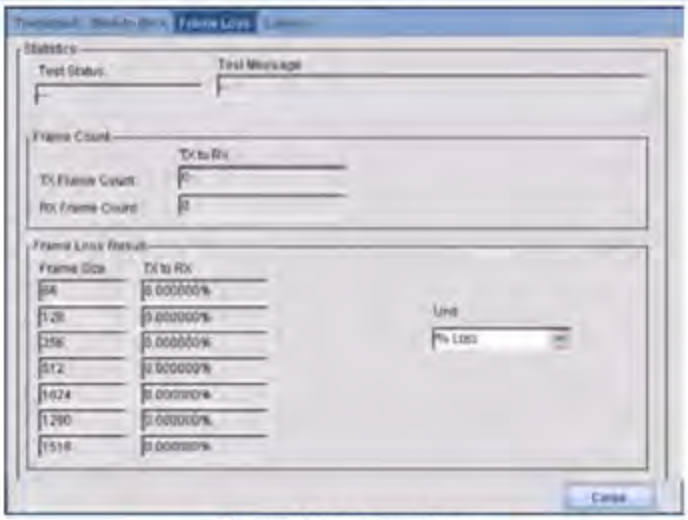
(Note: The result is ONLY available under RFC2544 Test.)

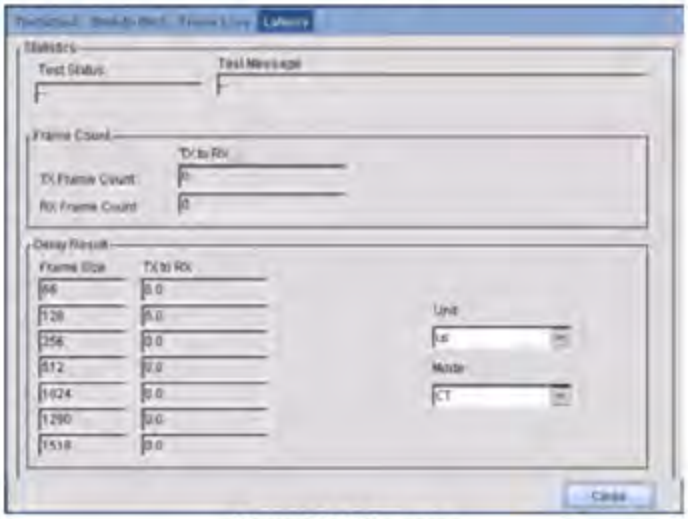
Table 10.2 RFC2544 Results

Sub Menu	Parameters
Throughout	• Test Status: • -- : Indicate the test has not been started; • Testing: Indicate the test is running; • Stop Test: Indicate the test has been done;
	• Test Message: Show the current test information, • For example: 'Packet: 64 Rate: 100.0%. Times: 1 transmitting test frames';
	• Frame Count: Count the quantity of frames from TX to RX, • TX Frame Count: Show the quantity of transmission frames; • RX Frame Count: Show the quantity of frames has been received;
	• Throughput Result: • Frame Size: Show the frame size; • TX to RX: Show the quantity of frames from TX to RX; • Unit: Select the throughput unit, support, • bps; • Bps; • Kbps; • KBps; • Mbps; • MBps; • Gbps; • GBps; • fps; • %;
	
	Figure 10.9 Throughout Result
Back to Back	• Test Status: • -- : Indicate the test has not been started; • Testing: Indicate the test is running; • Stop Test: Indicate the test has been done;
	• Test Message: Show the current test information, • For example: 'Packet: 64 Rate: 100.0%. Times: 1 transmitting test frames';
	• Frame Count: Count the quantity of frames from TX to RX, • TX Frame Count: Show the quantity of transmission frames; • RX Frame Count: Show the quantity of frames has been received;

Result

Sub Menu	Parameters
Back to Back	• Back-to-back Result: • Frame Size: Show the frame size; • TX to RX: Show the quantity of frames from TX to RX; • Unit: Select the back-to-back unit, support, • bps; • Bps; • Kbps; • KBps; • Mbps; • MBps; • Gbps; • GBps; • fps; • %;
	 Figure 10.10 Back to Back
Frame Loss	• Test Status: • -- : Indicate the test has not been started; • Testing: Indicate the test is running; • Stop Test: Indicate the test has been done;
	• Test Message: Show the current test information, • For example: 'Packet: 64 Rate: 100.0%. Times: 1 transmitting test frames';
	• Frame Count: Count the quantity of frames from TX to RX, • TX Frame Count: Show the quantity of transmission frames; • RX Frame Count: Show the quantity of frames has been received;
	• Frame Loss Result: • Frame Size: Show the frame size; • TX to RX: Show the quantity of frames from TX to RX; • Unit: Select the frame loss unit, support % only.

Sub Menu	Parameters
Frame Loss	 Figure 10.11 Frame Loss

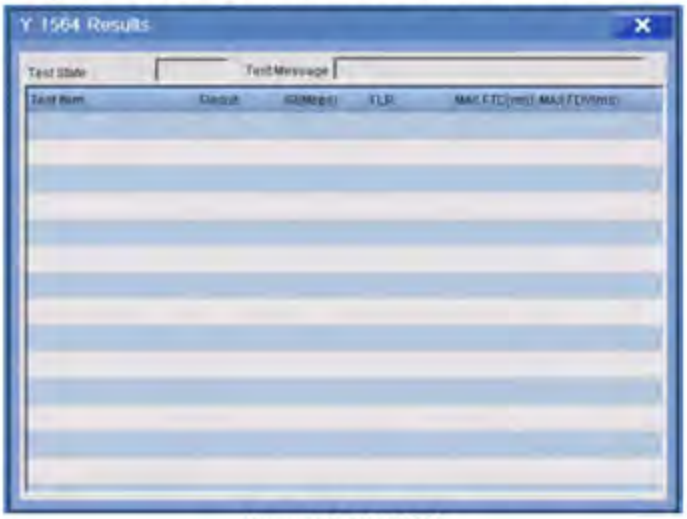
Latency	• Test Status:
	  • -- : Indicate the test has not been started;
	  • Testing: Indicate the test is running;
	  • Stop Test: Indicate the test has been done;
	• Test Message: Show the current test information,
	  • For example: 'Packet: 64 Rate: 100.0%. Times: 1 transmitting test frames';
	• Frame Count: Count the quantity of frames from TX to RX,
	  • TX Frame Count: Show the quantity of transmission frames;
	  • RX Frame Count: Show the quantity of frames has been received;
	• Delay Result:
	  • Frame Size: Show the frame size;
	  • TX to RX: Show the quantity of frames from TX to RX;
	  • Unit: Select the latency unit, support,
	  • us; • ms; • s;
	  • Model: Select latency model, support,
	  • CT; • SF.
	 
	Figure 10.12 Latency

10.3 Y.1564 Result

View Y.1564 test result needs to follow the following step:

- Select 'Y. 1564 Results' from 'Result' sub menu to view Y.1564 test result.
  (Note: The result is ONLY available under Y.1564 Test.)

Table 10.3 Y.1564 Result

Sub Menu	Parameters
Y.1564	• Test State: Display the test state;
	• Test Result: Show test result, include, • Test Item; • Result; • IR (Mbps); • FLR; • MAX FTD (ms); • MAX FDV (ms);
	• Test Message: Display the information during the test.
	 Figure 10.13 Y.1564

10.4 Service Disruption

Set Service Disruption needs to follow the following steps:

- Select 'Service Disruption' from 'Result' sub menu to set service disruption. Detail instruction has been demonstrated in Table 10.4 Service Disruption.

Table 10.4 Service Disruption

Sub Menu	Parameters
Service Disruption	• Configuration: • Measurement Mode: Select the service disruption measurement mode, support, • No Traffic: Indicate the time between the last frame has been received and a new frame has been received, or the time between the last frame has been received and the end of test period; • Threshold (us): Set value for service disruption test threshold, range from 1 to 100,000; ***(Note: When service disruption time is longer than the threshold, it will be regarded as one disruption.)***
	• Statistic: • Total Disruption Count: Display the times of SDT happened; • Minimum: Show the shortest disruption time which has been measured; • Maximum: Show the longest disruption time which has been measured; • Average: Show the average disruption time; • Current: Show the current disruption time caused by traffic absence or defect detection; • Unit: Select time unit, support, • ms; • s;
	 Figure 10.14 Service Disruption

11. Maintenance

Please follow the following instruction to maintain the device in order to long term operation with high accuracy and precision.

- Clean optical connectors every time before use;
- Avoid dust, dirt, and ash;
- Use slightly wet cloth to clean the device shell;
- Store the device under clean and dry environment and avoid direct sunshine;
- Avoid the high humidity and great temperature fluctuations environment;
- Avoid the fiercely vibration and impact;
- If any liquid has been spurted to the device or inside the device, please shut down the device immediately, and dry the device completely.

12. Troubleshooting

12.1 Common Problems Solutions

Table 12.1 describes some common problems and solutions of the module.

Table 12.1 Common Problems and Solutions

Phenomenon	Cause	Solution
Laser LED is off and the connector do not generate the signal	• Laser is off;	• Turn on the laser;
	• The rate of XPF optical module which has been inserted does not match with the test case;	• Make sure CFP module which has been inserted support the speed of the test case;
	• CFP optical module is not compatible with IVR-100G module;	• Make sure to use the an appropriate CFP optical module.

12.2 Technical Support Contact

If any other problems occurs, please contact InterVRE technical support or customer service immediately with product name, serial number ***(which can be found in product identification label)***, and a short description of the problem, which can make our technical supporters to solve your problems as soon as possible. Contact detail is demonstrated in below:

Technical Support

Tel: +52 5584374485 / +52 5621385218

Email: **jesica.garcia@intervre.com / heber.vallejo@intervre.com**

12.3 Transportation

Transportation environmental requirements must be strictly followed the Environmental Guidelines ***(Section 3.1: Environmental Guidelines)***. Improper and inappropriate operation has relatively high probability to cause permanent damage to the device. Follow the following instruction could minimise the possibility of damage occurrence:

- Use the device's original package to pack the device during transportation;
- Avoid to transport the device under the high humidity and great temperature fluctuation environment;

Troubleshooting

- Avoid direct sunlight;
- Avoid the fiercely vibration and impact.

13. Warranty

13.1 Warranty Statement

InterVRE guarantees this device will be warranted for 3 years from the date of initial shipment against the defects caused by material or manufacture.

During the warranty period, InterVRE has authority to repair, replace, or issues credit for any defective products. Free examination and adjustment service for the defective products which need to be repaired, or the products which have an inaccurate default calibration problem also will be provided during the warranty period. However, if the device was delivered back to the factory for examining an inaccurate default calibration problem, but eventually the examination result shows all the measurements meet the requirements which have been published in public, standard calibration fee will be charged by InterVRE even the product is in the warranty period.

The warranty will invalid if:

- Device has been opened or repaired by unauthorised person or non-InterVRE employees;
- Warranty sticker has been removed, or case has been opened without permission;
- Device's serial number has been modified, erased, or removed;
- Device has been damaged by misuse, or accident.

13.2 Disclaimer

InterVRE shall have no liability for any loss or damage resulting from the usage of the product, any performance failure of other items which is connected with the product, misuse or unauthorised modification of the product and its accessories and software. Also InterVRE shall have no liability for any loss or damage caused by force majeure or nature related to.

InterVRE reserves all the right to change and modify the product design and structure. InterVRE shall have no liability to modify any components of the products to meet the customer requirements after the products have been purchased. Accessories,

including but not limited to fuse, LED indicators, batteries and universal interfaces (EUI) used with InterVRE products are not covered by this warranty.

The warranty excludes the any loss or damage resulting from improper or inappropriate usage or installation, normal tear and wear, accident, negligence, fire, water, lightning strike or other force majeure of nature, which are beyond InterVREs responsibility.

13.3 Service and Repairs

InterVRE commits to provide product repair service for 5 years after the date of the product has been purchased. Following instruction may be helpful, if the device required a technical support or repair service:

- Please call InterVRE's technical support group *(Section 12.2: Technical Support Contact)*, type of service which is the device required will be determined by InterVRE'stechnical support employees;
- If the device must be returned to InterVRE or an authorised service centre, InterVRE's technical support employees will issue a Return Merchandise Authorisation (RMA) number and provide an address for returning;
- If possible, back up the device data before sending it back for repairing;
- Pack the device use its original package, please attach a detail report of defect and situation has been observed;
- Please deliver the device to the address which is provided by InterVRE'stechnical support group, and RMA number must be attached on the parcel otherwise the parcels will be rejected by InterVRE *(Section 13.1: Warrant Statement)*.

The device will be delivered back to customers immediately when repair or maintenance has been done, and a report with fully detail repair or maintenance information will be attached with the device as well. If the device is not in the warranty period, a receipt of the cost of the repair or maintenance service will be invoiced and attached to the report. If the device is in the warranty period, service fee will not be charged to the customers including the delivery fee for returning the device back, but delivery insurance will be at customer's expense.

interVRE

Service and Support

Sales Contact and Technical Support

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